

# Assessment Of The Impact Of CO Gas Emissions By Improving The Environmental Health Risk Analysis On The Basement Workers Of The Graha Pena Building And Makassar Town Square

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## **Abstract**

**Background :** *Air quality is degraded due to an increase in air pollutant sources from human activities, an increase in the economic and technology sector followed by a high consumption of motorized vehicles and an impact on an increase in the volume of transportation, where the transportation sector is a source of human activity as a contributor to 77% of total emissions. it was also found that the use of private cars as emitters is about 80% of total traffic vehicles. Material and method. The research method uses quantitative analysis with environmental health risk analysis, population determination is taken purposively, and population objects Carbon monoxide gas concentration in the basement parking area of the basement, Graha pen and, Makassar Town square.*

**Finding and discussion** *Quantitative results determine the concentration of carbon monoxide (CO) at the basement parking lot M tos shows the highest concentration measurement is at point 1 (Entrance in the morning is 16613.34  $\mu\text{g} / \text{Nm}^3$  and Dan for the basement parking lot Graha Pena shows the highest concentration measurement is in the middle in the morning, namely 15897.74  $\mu\text{g} / \text{Nm}^3$  quantitative data analyzed by calculating the EW, THQ and RQ values obtained for the saphiro-Wilk significance value obtained 0.016 for real-time RQ and 0.116 for 30-year RQ life time. For EW values are weekly carbon monoxide (CO) exposure obtained an average value of 10.130 mg / kg / week and the THQ value is carbon monoxide (CO) based on real time an average of 0.3771 is obtained where carbon monoxide (CO) based on real time obtained an average of 0.3771.*

**Conclusion** *Target Hazard Quotient (THQ) real time is not adventurous because of the THQ value  $\leq 1$  but for a life time of 30 years carbon monoxide (CO) exposure is risky because of the values obtained from THQ  $\geq 1$ .*

**Key words:** *carbon monoxide, , indoor air pollution, passive sampling, vehicle emission*

## 1. INTRODUCTION

The quality of air is degraded due to an increase in the source of air pollution by human activities, The increase in economic and technological development will be followed by the high consumption of motorized vehicles, which will have an impact on the volume of transportation avenues.(Raza et al. 2018)(Demir 2015), the transportation sector. Is a source of human activity that accounts for 77% of total emissions,(Ghorani-Azam 2016)

According to data from the Statistics Agency at the Central level, the addition of vehicle types in 2015 amounted to 121,394,185 units and in 2018 increased to 146,858,759 units, which means an increase of around 9%.(Central Bureau of Statistics 2019) .

The most pollutant produced by motorized vehicles is carbon monoxide (CO).(Jansen 2011)(Official 2002) , thereafter Sekardi 2017, stated that the longer the rotation or wheel rotation of the vehicle per minute, the greater the level of CO emitted..(Sekaryadi and Santosa 2017)

Based on the definition of EPA (2010), there are four elements that affect the indoor air pollution system (PUDR), namely: internal and external sources, ventilation systems, carrier media (air in the room) and a history of workers living in space, indoor air pollution. far greater than the pollution outside of money. and it is estimated that every year there are about 3 million deaths due to air pollution, of which 2.8 million are due to PUDR while the rest are due to outdoor pollution.(Huboyo 2016)

A 2015 United State Environmental Protection Agency (US EPA) study on the chances of humans being exposed to pollution indicated that the degree of indoor pollution could be two to five times higher than that of pollution.outdoor space.(Herman et al., n.d.)withthe development of the development of more and more parking lots needed in order to provide satisfactory service.(Kasim 2018)(Rorah, Huboyo, and Istirokhatun, n.d.).

In 2016 the number of motorbikes in Makassar reached 1,128,809 units. The number of two-wheeled vehicles is far away compared to four wheeled vehicles. Passenger cars (206,435 units), buses (17,264 units), goods cars (72,239 units), and special vehicles (403 units). The rapid growth of motorized vehicles is one of the triggers for air quality problems in Makassar City. The reason is that the growth rate of motorized vehicles is not comparable to the growth of roads and land which is only 1.28%.(BPS 2015)

The construction of a basement for a parking lot is a solution used by building managers in overcoming the problem of limited land. The air in the basement is unfreeable air. The staff in the basement have a great potential to be exposed to CO gas trapped in the room while working. The CO gas that the officer inhales will enter the blood, 80–90%

The parking space on the ground floor / basement is the main entrance to parking in the building so that there are more vehicles passing in the area, but have less air openings. The limited space causes limited air movement even though there has been turbulence from moving vehicles.(Fitrianingsih et al. 2011)

Based on the facts above, the research wants to examine how the air quality in the basement of the Graha Pena and MTos building parking lots,

## 2. METERIAL AND METHOD

This study aims to assess the carbon monoxide gas exposure. This research is an analytic observational study with cross sectional method. For the amount of health risk using Environmental Health Risk Analysis

Risk analysis is a risk management tool, a joint assessment process of scientists and bureaucrats to estimate the increase in health risk in exposed humans (NRC, 1983). This research was conducted in four stages, namely (hazard identification), (exposure assessment), (dose response assessment), (risk characterization). (Fsis 2012)

The location of this research is in the basement parking area of MTOZ and Graha Pena. This research includes measuring the concentration of CO and COHB in the blood and other variables related to parking attendants such as length of work and body weight of the respondents.

Meteorologist measurement instruments use a thermohygrometer, flow meter, and for health complaints in the form of a questionnaire which is conducted openly to determine the health complaints of parking attendants in the basement.

Concentration If the CO exposure concentration has been obtained from the exposure analysis process, then the intake calculation is carried out. The intake formula used is:

$$I_k = \frac{C \times R \times tE \times E \times dt}{W_b \times t_{avg}}$$

With:

I = intake, namely the amount of concentration of risk agents that enter the human body with a certain body weight (mg / hour / kg body weight).

C = concentration of CO exposure to respiration ( $\mu\text{g} / \text{m}^3$ ).

R = inhalation rate or human respiration rate, equal to 0.12  $\text{m}^3 / \text{hour}$

W = body weight (kg).

tE = time of exposure, namely the length or number of hours the exposure occurs each day

Dt = (Duration Time) length / number of years the exposure occurred

Tavg = (time average), namely the average time period of the day, 30 years x 365 days / year = 10,950 days (zero carcinogens) or 70 years x 365 days, years = 25,550 days (carcinogens)

Furthermore, data analysis has been obtained from exposure analysis and intake calculation using statistical tests. For the relationship between COHB levels, the statistical tests used were descriptive statistical tests and the saphiro-Wilk significance test. Descriptive statistical analysis aims to compute data descriptions such as means, mode, and standard deviation.

### 3. RESULTS AND DISCUSSION

#### *Research Location Overview*

Makassar Town square is managed by the parking management of PT TuzaMandiri (go parking) under the parent management of PT Intiland Jakarta with a dedicated parking area for motorbikes of 3158  $\text{m}^2$  with a tamping capacity for 400 units of cars and 1000 units of motorbikes. Meanwhile, parking management is handled by management with a parking area of 72  $\text{m}^2$  and tamping capacity for cars. 100 units and 1500 units of motorcycles.

The two basement parking lots are at Mtos and Grentukenaimplement a professional security management system. For management M tos has parking officers divided into several shifts and totaling 20 people, while Grupasena has 15 officers who usually work in the parking lot,

consisting of parking cashiers at the exit, and security officers, as well as several cleaning services.

*Result*

*Characteristics of Respondents*

Age, gender, body weight, length of work, age, last education ,. These individual characteristics can be variables that can affect health problems

Table 1 Measurement of CO Concentration in the basement parking lot of MTos Parking and Makassar City GrahaPena in 2020

Location	Time	const CO (µg / Nm3)	mean concentration (µg / Nm3)
Mtos	morning	16613.34	15995.17
Point 1	Noon	<b>15442.12</b>	
	afternoon	15930.07	
point 2	morning	15539.78	15637.32
	Noon	<b>15442.12</b>	
	afternoon	15930.07	
point 3	morning	13685.96	14835.18
	Noon	<b>15409.79</b>	
	afternoon	15409.79	
Grahapena			
point 1	morning	12970.04	<b>14065.26</b>
	Noon	<b>14954.50</b>	
	afternoon	14271.24	
Point2	morning	15897.74	15008.60
	Noon	<b>14824.18</b>	
	afternoon	14303.90	
Point 3	morning	13620.64	14173.69
	Noon	<b>14271.24</b>	
	afternoon	14629.20	

Source: Primary Data Processed, 2020

The mean CO concentration was 14,9521, the median15.1799, Std. deviation 957.44. The average CO concentration is below the maximum concentration required by the South Sulawesi Governor Regulation No. 69 of 2010.

Transportation generates the most CO among other CO sources, especially from vehicles that use gasoline as fuel. The concentration of CO in the air per time of the day is influenced by the busyness or activity of existing motorized vehicles. Getting crowded

Parking attendants and other workers such as cleaning services, security guards also have a high risk. Every day vehicles enter and leave, so that it affects the environment around the parking space (basement). The little air ventilation plus vehicle gas emissions and the exhaust of electric generator gases makes the air in the room around the basement feel hot and stuffy. This situation makes workers including those in the basement parking very vulnerable

Indicator Intake on Respondents in this study worked as parking attendants in the basement parking lot of ParkingMTos and Grapiena, Makassar City, the number of working hours was one of the factors to assess the amount of CO exposure risk received. In addition to working

hours or length of exposure, another variable that needs to be taken into account is the number of days worked per year because working hours vary as well as parking workers, security and cleaning services, so that a descriptive analysis is carried out on the number of hours worked per year because working hours vary as well as parking attendants, security and cleaning services, so that a descriptive analysis is carried out on the number of hours worked per year. Besides that, the influencing factors were exposure duration (years), body weight (Kg) of each respondent at the study location.

a. *Time of exposure / exposure time (tE)*

The time of exposure (tE) is expressed as 8 hours per day of the correspondence. Based on the results of interviews with respondents, the number of working hours in a day is 8 hours, according to the rules set by the authorized parking management.

b. *exposure frequency (EF)*

This variable is obtained from the results of the calculation of the total number of hours of work of parking attendants as long as the years are reduced by the number of holidays / leave. officer parking. Based on the results of the calculation, respondents at the location experienced the most exposure for 365 days per year. In this study, each respondent received a work shift during the line set in a Corona virus pandemic situation by using physical distancing. However, there is an excess of parking attendants for as many as 8 hours a week so that it can be said that in at least 36 days get a work holiday or a task. The total is subtracted from the number of days in the total of 365 days, so that the exposure duration in one year is 365 days / year.

c. *Duration of exposure / Exposure Duration (ED)*

The duration of exposure is obtained based on the results of the questionnaire processing from the length of time the respondent has worked as a parking officer. The amount was calculated since the respondent first worked as parking attendant. The units used in this variable are years. The results of data processing in table 4.10 show that the exposure duration is between 1-16 years, the average value is 7.33 years, the median value is 7.00, Standardeviability is 3.959, because the data is not normally distributed, the p value of exposure duration is 0.075 is smaller than 0.05, so the categorical determination is used as the median value. The interval estimate can be inferred that 95% assured sleep exposure is between 5.85 years and 8.81 years.

d. *Inhalation Rate (IR)*

Determination of the amount of the rate was based on the 2011 US EPA assessment standards based on age and sex. Calculate the IR value (hours) compared to 24 hours / day, then check the hours worked in days to get the daily rate of daily work. The intake indicator is in the form of Inhalation Rate (IR) obtained by an average value of 0.0501 m<sup>3</sup> / day, the lowest inhalation rate is 0.01 m<sup>3</sup> / day and the highest is 0.01 m<sup>3</sup> / day, the median value is 0.0507 m<sup>3</sup> / day, the standard of effectiveness is 0.1654, because the data is distributed normal, namely p = 0.292 greater than 0.05 then in the determination of the category the median value is used as the middle value. Interval estimates of 95% believed that the initiation rate was between 0.0439 m<sup>3</sup> / day and 0.0563 m<sup>3</sup> / day.

e. *Body weight (WB)*

Body weight in this study is the weight of workers such as parking attendants, security guards and cleaning services at the time of the study. The respondent's body weight intake indicator obtained an average value of 60.80 kg, the respondent's body weight ranged from 40 kg to 84 kg, the median value was 59.50 kg, the standard value was 12,126, because the data were normally distributed, namely p. The 95% interval estimate is certain that the respondent's body weight is between 56.27 kg and 65.32 kg.

The characteristics of the ricoinidities were performed by comparing / dividing the intake with the doses / concentrations of the agenycotic. The variables used to calculate the level of risk were intake (obtained from the exposure analysis) and reference concentration (RfC). How to calculate the risk level (RQ) using the formula:

$$RQ = \text{Intake} / RfC$$

The level of the initial risk is not in numbers or in decimal numbers without the unit. level of risk said Safe / not risk if  $RQ \leq 1$ . The level of risk is declared Unsafe / Risky if  $RQ > 1$ .

*f. Intake*

This is the exposure level used to determine the amount of exposure to the critical agent, carbon monoxide (CO), which the respondent receives per kilogram of body weight per day. The concentration value can be obtained from laboratory examinations of the CO concentration in the air. The value of R is obtained from the EPA standard (2011), based on age and type of sunshine, while fE, tE, and Dt are obtained from the results of interviews with respondents. The tAvg value was obtained from the US.EPA standard for agent effect, where the non-carcinogenic effect (30 years x 365 days / year = 10 950 days) and the carcinogenic effect (70 years X 365 days / year = 25550 days), then continued by calculating the RQ value. The results of the survey found that (respondent No.24 Ismail) had a body weight (WB) of 60 kg, an Inhalation rate (R) 0.83 m<sup>3</sup> / hour, exposure frequency (fE) 345 days / year, duration of exposure (Dt) for 4 years, exposure time (tE) 8 hour / day, Consc. carbon monoxide (CO) is 14.30 mg / m<sup>3</sup>, the value of RfC CO is 0.15395 mg / kg / day and non-carcinogenic AT 30x365 = 10950 days.

Table 3 Intake (I) of carbon monoxide (CO) exposure at Parking Officers at Mtos and Graha Pena of Makassar City in 2020

Statistik	Real Time	Intake (I)
	Karbon	Life Time 30 tahun
	monoksida	Karbon
	(CO)	(CO)
Mean	0,3771	1,6151
Median	0,3930	1,5734
Std. Deviasi	0,2002	0,3513
Minimum	0,1289	1,1076
Maximum	0,8314	2,4718
Varian	0,040	0,123
95% CI	0,3023	1,4839
	0,4519	1,7463
Signifikansi	0,016	0,116

Sumber: Data Primer, 2020.

Table 4.RQ (Risk Question) of carbon monoxide (CO) exposure on Parking Officers at Gragedena and Mtos of Makassar City in 2020

Statistik	Real Time	Risk Question (RQ)
	Karbon	Life Time 30 tahun
	monoksida	monoksida
	(CO)	(CO)
Mean	2,4496	10,4915
Median	2,5531	10,3665
Std. Deviasi	1,3009	2,2824
Minimum	0,8376	7,1945
Maximum	5,4009	16,0558
Varian	1,693	5,210
95% CI	1,9638	9,6392
	2,9354	11,3438
Signifikansi	0,016	0,116

Sumber: Data Primer, 2020.

Risk Question (RQ) The average real time CO obtained was 2.4496, the median value of CO was 2.5531, the minimum and maximum range of the CO Quick Question was 0.8376 to 5,4009, while the 30-year Disk Question life average was 10.4915, the median value of CO was 10.3665 with a range of minimum and maximum values from 7.1945 to 16.0558, for the phiro-wilk significance values 0.016 for realtime RQ and 0.116 for 30-year RQ life time were obtained.

g. *Estimated Weekly Intake (EWI) Calculation*

Table 5 Estimation of Weekly Intake of Carbon Monoxide (CO) of Parking Officers of Grahapena and Mtos of Makassar City in 2020

Variabel	Mean	Min	95% CI	SD	Sig ro-wilk	Sig Kolmo gorov-smirno v
	Median	Max				
Karbon						
Monoksida	10.130	7.030	9.419	2.230	0,116	0,200
(CO)	9.987	15.690	11.085			

Sumber: Data Primer, 2020.

Table 5. Estimated weekly intake of carbon monoxide (CO) exposure obtained a mean value of 10,130 mg / kg / week, the median value of CO was 9,987 mg / kg / week, Std. Deviation obtained was 2,230 mg / kg / week, the range of weekly intake values was between 7,030 mg / kg / week to 15,690 mg / kg / week, while the estimated interval from 95% was 0.2668 mg / kg / week to 0.3119 mg / kg. /Sunday. With the Shaphiro-Wilk Sig value of 0.116 and the Kolmogorov-Sminov Sig value of 0.200 with a Sig value of > 0.05 so that the data is normally distributed so that the mean value is used as an average value of 9.987 mg / kg / week.

Table 6 Level of risk (THQ) Non-carcinogenic CO to Parking Officers Mtos and Granapena of Makassar City in 2020

Statistik	Target Hazard Quotient (THQ)	
	Real Time Karbon	Life Time 30 tahun Karbon
	Monoksida (CO)	monoksida (CO)
Mean	0.3771	1.6151
Median	0.3930	1.5734
Std. Deviasi	0.2002	0.3513
Minimum	0.1289	1.1076
Maximum	0.8314	2.4718
Varian	0,040	0,123
95% CI	0.30233 0.45191	1.4839 1.7463
Signifikasi Shapiro- wilk	0,016	0,116
Signifikasi Kolmogorov- Smirnov	0.026	0.200

Sumber: Data Primer, 2020

Table 6, Target Hazard Quotient (THQ) of carbon monoxide (CO) based on real time obtained an average of 0.3771, median CO value is 0.3930, Std. Deviation is 0.2002, THQ values range from  $7.10 \cdot 10^{-6}$  to  $8.10 \cdot 10^{-5}$ , estimated interval from 95% is 0.1289 0.8314 from the significance of Shapiro-wilk 0.016. Meanwhile Target Hazard Quotient(THQ) carbon monoxide (CO)

Based on Lifetime to date For 30 years the mean was 1.6151, the median CO is 1.5734, Std. The deviation was obtained 0.3513 values range level risk is 1.1076 to 2.4718, while the interval estimate from 95% is believed to be 1.4839 to 1.7463 and the Shapiro-Wilk significance of 0.116 and the Kolmogorov-Smirnov significance is 0.200.

#### 4. DISCUSSION

Research by Tiwaryet al (2012), the average concentration of CO in parking attendants can vary depending on the location and time of duty. Those who work in areas where there is a lot of vehicles will be exposed to higher CO exposure than those who work in areas with few vehicles. CO exposure on weekdays was higher than on weekends. CO pollution is generally high in areas that are visited by vehicles such as traffic and parking areas due to vehicles and contributes about 60% of all CO emissions. The CO concentration in the vehicle is generally 25 ppm and the level depends on the density of the vehicle. The denser the vehicle, the higher the CO pollution.(A. Tiwary\* 2012)

The results of research by Rose, et al. (2014) on the Traffic Police found that the number of traffic police work days in a week, it is known that the average traffic police work 8 hours per 7 days per week, the highest intake received by the Traffic Police for CO parameters is 0.1918 mg / kg / day RQ value <1. The number of hours worked and time worked in a week also had an effect on the concentration of lead exposure in the body ((Kurnia Dwi Cahya Rose 2014)

Wardani's research (2012) states that the number of parking attendant working hours in a day can reach 12 hours even though no one works up to 7 days a week and on average has worked more than 5 years., Besides that, according to research Mostafa Hadei (2019) found



that CO concentrations were higher during the summer season than during the winter. (Hadei1 et al. 2019)

#### *Duration of exposure (Exposure Duration)*

The duration of exposure is the length of time the respondent works as a parking attendant in a matter of years, while the time of daily exposure is the length of time the respondent works or inhales air contaminated with pollutants, especially carbon monoxide (CO) within one day.

The results of this study are the highest length of exposure is 8 years with the number of hours worked per day is 8 hours. means that the longest respondent as a parking attendant is 8 hours per day for 8 years. The mean duration of exposure was 7.33 years.

The high duration of exposure to parking attendants can result in high exposure to CO in parking lots from motorized vehicles. The use of masks while working can repel the least amount of CO pollutants that enter through inhalation. The assessment of the exposure to a parameter in the air can have an impact on the health of a worker by knowing his tenure The interval estimate can be inferred that 95% assured sleep exposure is between 5.85 years and 8.81 years.

Time, frequency, duration of exposure greatly influence the size of the intake obtained. These factors have the same unit, namely the time at which the concentration will accumulate in the respondent's body depending on how long it takes. The greater the value of time, frequency and duration of exposure, the greater the intake. This means that the longer the daily exposure or annual frequency of a person with a discount agent, the greater the intake value received and the more he is at risk of health problems due to exposure to the risk agent.

Results of research reports CL Townsend (2002) states that there is Anecdotal evidence suggesting that chronic exposure to CO can have mild neurological effects. This includes an inflammatory response that begins during the recovery phase when oxygen in the blood begins to increase, intellectual deterioration, memory impairment, and changes in emotional stability. It is generally assumed that such effects occur only after severe poisoning of carbon monoxides. (C L Townsend 2002)

#### *Estimated weekly Intake (EWI)*

Weekly intake estimates are carried out in relation to determining the estimated hazard target of a pollutant exposure.

Estimated mean weekly intake of carbon monoxide (CO) was 10,130 mg / kg / week, the lowest weekly intake was 7,030 mg / kg / week and the highest was 15,690 mg / kg / week. Based on the Shapiro-Wilk test, the value of  $p = 0.116$  or  $p > 0.05$  or so that the data is normally distributed is used so that in the determination of the frequency distribution categories the mean value is used as the middle value.

#### *Target Hazard Quotient (THQ)*

Target Hazard Quotient (THQ) is used to estimate the potential health risks associated with long-term exposure to exposure to carbon monoxide (CO) pollutants. The THQ value is an index that shows the risks associated with long-term exposure to CO pollutants based on safe reference limits. CO is non-carcinogenic. Assessment of the Target Hazard Quotient (THQ) that the THQ is greater than 1 is an indication of the risk of health problems so it is necessary to control and manage the risk, while  $THQ \leq 1$  is an indication of the small risk for health problems so that the condition needs to be maintained.

THQ calculation of carbon monoxide (CO) exposure of 30 respondents was obtained from  $THQ \leq 1$ . The results of this study showed that the real time average CO exposure was

0.3771. there are non-carcinogenic health risks, so that health risks need to be controlled by providing maximum protection for employees exposed to carbon monoxide.

#### *Risk Quotient (RQ)*

Risk assessment is obtained through intake. The measured intake or intake value is influenced by duration and daily time of exposure, body weight, inhalation rate for each person and frequency of exposure.

The calculation of intake for respondents was obtained from the value of non-carcinogenic carbon monoxide (CO) exposure in real time with an average of 0.3771 mg / kg / day, and non-carcinogenic CO intake, life time up to 30 years, obtained an average of 1.6151 mg / kg / day. .

Calculation of the real risk level of the carbon monoxide (CO) exposure team from a total of 30 respondents, none of them are at risk because of the value obtained  $\leq 1$  and for exposure to carbon monoxide (CO), the life time of the respondent is 30 years at risk because of the RQ values  $\geq 1$ . Based on these results, all respondents indicate non-carcinogenic health risks, so that these health risks need to be controlled because the RQ numerical value exceeds 1.

If an exposure contains hazards, the magnitude of the risk (RQ) of these substances can be accumulated under several conditions. The main requirement is that these pollutants can cause the same effect and are detrimental to health. In addition, these substances must also have the same target organs.(Gallagher, nd)

## 5. CONCLUSION

1. The concentration of carbon monoxide (CO) in the basement parking lot M tos shows the highest concentration measurement is at point 1 (Entrance in the morning at the basement of Mtos parking is 16613.34 $\mu\text{g} / \text{Nm}^3$  while the lowest concentration is at point 3 (Exit of the parking basement M Tos ) namely 13685.96 $\mu\text{g} / \text{Nm}^3$ , and for the basement of the Graha Pena park, the highest concentration measurement is in the middle in the morning, namely 15897.74  $\mu\text{g} / \text{Nm}^3$ . the middle part in the morning is 15897.74  $\mu\text{g} / \text{Nm}^3$

2. Target Hazard Quotient (THQ) carbon monoxide (CO) based on real time obtained an average of 0.3771 and for a life time of 30 years obtained an average of 1.6151, which indicates Target Hazard Quotient(THQ) real time is not adventurous because of the THQ value  $\leq 1$  but for a life time of 30 years carbon monoxide (CO) exposure is risky because of the values obtained from THQ  $\geq 1$ .

In order to prevent and minimize the risk due to carbon monoxide exposure in the basement parking lot, follow-up suggestions are as follows:

a. To Respondents (Parking Officers, Cleaning service and Security Guard it is necessary to carry out regular health checks, especially those related to exposure to motor vehicle pollutants.

b. It is necessary to communicate the risk to workers about the impact of carbon monoxide exposure in order to take preventive action as early as possible in order to minimize the risks that will arise in the future.

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