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The Effect of Implementing Smoke-Free Areas on Indoor Air Quality in Kulon Progo

Oktavian Denta[1)], Mahmuda Jundi✉[1)], Arief Musthofa[2)], Theodola Baning[2)]

[1] SemarKu (Sinergi Bersama Mengurangi Bersama Mengurangi Asap Rokok di Kulon Progo), Jl. Tamtama No 13, Terbah, Wates, Kulon Progo, D.I. Yogyakarta, Indonesia 55651
[2] Dinas Kesehatan Kabupaten Kulon Progo, D.I. Yogyakarta, Indonesia 55651
✉Email: ktr.kulonprogo@gmail.com

ABSTRACT

***Background**: The development of a city affects air pollution. Indonesia is the third country in the world with the highest number of smokers in the world. Smoking behavior produces smoke that comes from chemicals and dust or particulate matter. Pollution in closed places also has a risk that is 2 – 5 times higher than in open places. In monitoring and evaluating compliance with smoke-free areas (KTR) in Kulon Progo in 2023, from 7 areas, it was found that there were 3 areas with low compliance, namely teaching and learning facilities, workplaces & public places. **Aims**: This research reveals the differences between places that comply and do not comply with the KTR Regional Regulation and their relationship with indoor air quality to prove whether the implementation of No-Smoking Areas influences indoor air quality. **Method**: Descriptive research method with quantitative analysis using SPSS. Primary data collection by observation refers to the KTR implementation monitoring checklist and air quality measurements using particulate dust meters and anemometers. **Results**: The results of the KTR sample data collection illustrate that KTR compliance has a positive effect on air quality with a significance value of 0.48. The dominant violations are the provision of ashtrays, the discovery of cigarette butts, and people smoking outside designated places, both indoors and outdoors. Findings of indoor violations greatly affect the levels of PM 2.5 and PM 10 in the air. **Conclusion**: Exposure to air pollution such as PM that exceeds the threshold can cause health problems and reduce productivity. So implementing optimal KTR regulations can improve indoor air quality. Consistency is needed from the person in charge of the area in supervision to increase compliance. Improving air quality is also expected to improve the health and productivity of students, employees, and the community.*

***Keywords**: KTR, Air Quality, Compliance, PM*

INTRODUCTION

The development of a city is something that cannot be avoided. This also affects air pollution because it is mixed with various components. Air pollution is a situation where physical, biological, or chemical substances in the air layer on Earth in sufficient quantities can cause danger to the health of humans and other living creatures (Siburian, 2020). This also affects air quality in spaces where the air conditions in the building or structure, especially those related to the health and comfort of building occupants, will also be affected (Minister of Health Regulation No. 2 of 2023). Air quality is influenced by primary pollutants, which are released directly from certain sources and can be gasses or particles. Pollutants included in gas form are carbon (C), sulfur (S), nitrogen (N), and halogen compounds, while pollutants in particle form are in the form of solid substances or liquid aerosol suspensions including Particulate Matter (Mukono, 2003).

One of the air components that can harm health is Particulate Matter (PM). PM2.5 (particulates) are air particles smaller than 2.5 microns (micrometers). The threshold value (NAB) for PM2.5 is 65 µg/m3 (Meteorology, Climatology and Geophysics Agency, 2019). Particles contained in ambient air generally measure 0.1 – 50 µm or more. The main parameter for air pollution particles is a diameter of 2.5 µm or less. Air particles

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measuring less than 2.5 µm (PM2.5) are called fine particles, and PM10 are air particles measuring less than 10 µm. Fine air particles are very dangerous because they can penetrate the deepest parts of the lungs and heart system, causing health problems, such as acute respiratory infections, lung cancer, cardiovascular disease, and even death. Fine air particles generally come from anthropogenic sources such as motorized vehicles, biomass burning, and fuel burning (Mukhtar *et al*., 2013).

Based on the results of a field survey conducted by the Global Adults Tobacco Survey (GATS), the number of adult smokers in Indonesia is 70.2 million. This places Indonesia as the third country in the world with the highest burden of smokers. According to the Global Youth Tobacco Survey (GYTS), 3 out of 4 people start smoking at the age of less than 20 years (World Health Organization, 2014). Even though an active smoker affects overall organ health. Smoking behavior can also cause death in passive smokers. Approximately 41,000 deaths in adults and 400 deaths in infants each year are caused by exposure to cigarette smoke. Adult passive smoking causes many health problems such as stroke, lung cancer and coronary heart disease (CDC, 2020b). The risk of exposure to passive smoke does not end when the smoker stops smoking. Pollutants from smoking behavior, especially in the form of gas, can be expelled through ventilation, but can also remain on surfaces for a certain time and can cause third hand *smoke*. A person can be exposed to *third-hand smoke* through inhalation, ingestion or skin contact on any surface in the house or other closed room. The impact of *thirdhand smoke* on health is the risk of cancer, damage to internal organs such as the cardiovascular system and liver, triggering lung inflammation which can result in Chronic Obstructive Pulmonary Disease (COPD), asthma, and the risk of type 2 diabetes (P2PTM Ministry of Health of the Republic of Indonesia, 2018).

Based on data from the Global Burden Diseases 2019 Diseases and Injuries Collaborators, 5 respiratory diseases cause the highest number of deaths in the world, namely chronic obstructive pulmonary disease (COPD), pneumonia, lung cancer, tuberculosis, and asthma (GBD 2019 Diseases and Injuries Collaborators, 2020). Apart from that, smoking produces smoke which has the potential to cause air pollution originating from chemicals, dust, or particulate matter. Pollution in closed places has a risk of 2-5 times more pollution than in open places (10 EPA “Indoor Air Plus”, 2012)

The high health impacts resulting from smoking behavior require efforts to control cigarette consumption. The government has made various efforts to control the impact of smoking on health, such as requiring the implementation of the smoke-free zone (KTR) policy as outlined in Law No. 17 of 2023 concerning Health Article 151 paragraph 2 and PP Number 109 of 2012 concerning Safeguarding of Materials Containing Addictive Substances in the Form of Tobacco Products for Health article 52. The form of implementation of this policy is outlined in the No Smoking Zone (KTR) policy in various regions in Indonesia in the form of Regional regulations and regional head regulations.

Kulon Progo Regency in the Special Region of Yogyakarta has ratified it Regional Regulation (Perda) of Kulon Progo Regency no. 5 of 2014 concerning non-smoking areas which was revealed in Kulon Progo Regent's Regulation no. 3 of 2015 concerning implementation guidelines for the KTR regional regulation which has been revised with regent's regulation no. 15 of 2020. The main objective of the No-Smoking Area (KTR) is to protect and guarantee the community's right to clean and healthy air without cigarette smoke. There are 7 non-smoking areas regulated in the Kulon Progo Regional Regulation no. 5 of 2014 concerning KTR article 4 paragraph 1, namely Teaching and Learning Facilities, Health Service Facilities, Children's Playgrounds, Places of Worship, Public Transport, and other designated Public Places. In its implementation, the regional government of Kulon Progo Regency carries out evaluation and monitoring using a compliance checklist for implementing smoke-free areas which has 10 indicators, namely: Has socialization of the KTR Regional Regulation been carried out, There is a KTR Supervision Task Force, There are KTR Signs and Warnings Prohibiting Smoking, There are appropriate designated Smoking Places. with the

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provisions, no people are smoking, no cigarette butts, no ashtrays, no Cigarette Promotion media, No Cigarette Sales and no cigarette smell.

In the Monitoring and Evaluation carried out by SemarKu together with the health service in 2023, smoking-free areas were still found where KTR was not implemented optimally. It is known that of the 7 areas without smoking, there are 3 areas where people are still found smoking outside the designated places, there are still designated smoking rooms that do not comply with the provisions and cigarette butts are found which indicates that there is still smoking activity in the KTR. These areas are teaching and learning facilities, workplaces & public places.

So in this research, we want to know the differences between places that comply and do not comply with the KTR Regional Regulation and their relationship with indoor air quality to prove whether the implementation of No-Smoking Areas influences indoor air quality.

METHODS

The method in this research uses qualitative analysis with descriptive methods. Presenting primary data using observations using monitoring checklists for implementing KTR and measuring air quality using measuring instruments. Observations were carried out using a monitoring checklist for compliance with regional regulations number 5 of 2014 concerning smoking-free areas which has 10 indicators. A non-smoking area that is observed by looking at these indicators is said to be compliant if it meets all the indicators, but if one does not fulfill it then the area is declared non-compliant. Observations were carried out with the naked eye at the KTR and interviews by paying attention to the following indicators:

1. There was a socialization of Regional Regulation No. 5 of 2014 concerning Smoking-Free Areas to Staff/Pupils/Students/Other Management
2. There is a KTR Implementation Task Force
3. An announcement or sign is attached stating that the place is a KTR
4. There is a warning about no smoking
5. people are smoking outside the designated areas
6. There are ashtrays outside the designated areas
7. Cigarette butts were found outside the designated area
8. Found a cigarette advertisement
9. Cigarette sales were found in the KTR area
10. Smells of cigarettes

Measurements use measuring instruments in the form of the Anmo-300 Anemometer which is an airspeed meter and low volume measurement with a quality standard of 0.15-0.25 m/s and the DAZ-400 Particulate Dust Meter which has the function of measuring PM2.5 dust particle counts with a standard quality 25 $\mu g/m^3$, PM10 with a quality standard of 70 $\mu g/m^3$, temperature with a quality standard of 40-60% Rh and humidity with a quality standard of 18-30°C. The quality standards used are per Minister of Health Regulation Number 2 of 2023 concerning Implementing Regulations of Government Regulation Number 66 of 2014 concerning Environmental Health. Measurements are carried out by trained personnel. Measurements were carried out in 2-3 rooms at KTR for 5-15 minutes. An area is declared as meeting air quality requirements when all indicators do not exceed quality standards, but if one indicator exceeds quality standards then the area is declared not to meet air quality requirements.

The population in this study is the monitoring point for the evaluation of the implementation of smoking-free areas in 2023, Kulon Progo district in 7 smoking-free areas. The sample in this study was selected using simplified random sampling in non-smoking areas with low compliance achieved at 50 points in 3 areas, namely Teaching and Learning Facilities, Workplaces, and Public Places.

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RESULTS AND DISCUSSION

Table 1. KTR Compliance Results & Air Quality Measurements for Teaching and Learning Facilities

Teaching and Learning Facilities	Meets Air Quality Requirements	%	Does not meet air quality requirements	%
Comply with KTR	9	81.82%	0	0.00%
Not Complying with KTR	1	9.09%	1	9.09%
N	**11**			

Learning Facilities

In teaching and learning facilities, 9 points (81.82%) were found that complied with the 10 indicators of non-smoking areas and met air quality requirements. There was a finding of 1 school that met air quality but did not comply with KTR. At this school, cigarette butts were still found in the yard, indicating that there was still smoking activity in the non-smoking area but the quality of air was still in the standard. There is 1 school that does not meet air quality requirements and does not comply with KTR. At the school, ashtrays, lit cigarette butts, and a room that smelled of cigarettes were still found. It was found that in the room measured using a particulate meter, PM 2.5 measurements reached 203 µg/m^3, and PM 10 reached 429 µg/m^3 but the airflow was found to be good.

According to the Regulation of the Minister of Education and Culture (Permendikbud) of the Republic of Indonesia Number 64 of 2015 concerning KTR in the School Environment, the definition of a Non-Smoking Area is a room or area that is declared prohibited for smoking activities or activities for producing, selling and/or promoting cigarettes. The implementation of Minister of Education and Culture Regulation No. 64 of 2015 in Kulon Progo Regency was also strengthened by the ratification of Perbup No. 3 of 2015 concerning Guidelines for the Implementation of Kulon Progo Regency Regional Regulation No. 5 of 2014 concerning Non-Smoking Areas Article 7 which states that Teaching and Learning Facilities from Early Childhood Education (PAUD) to Universities and other places of study are KTR. However, from the results of observations, 2 schools did not comply with KTR because cigarette butts were still found which indicated that there was still smoking activity in non-smoking areas. Apart from that, there are still ashtrays provided in the school environment.

The high levels of PM 2.5 and PM10 found in schools due to exposure to cigarette smoke indoors hurt children's health. In research conducted on elementary school students in the Bogor district in 2018, it was proven that there was a significant relationship between the concentration of PM10 in classroom air and the incidence of ISPA in students (JNKLG. 2020). According to Grineski, Clark-Reyna, and Collins in their research in Mexico, the United States showed a significant relationship between PM 2.5 and students' average grades, indicated by a decrease in scores of around 0.11 to 0.25 as PM 2.5 exposure was received (Gilliland *et al.*, 2001). Another study in Chile stated that there was a decrease in mathematics scores of 0.4 and a decrease in language test scores of around 0.23 for every increase in exposure to PM 2.5 concentrations of 1 µg/m3 per year (Jimenez and Jordan, 2019). Apart from affecting the quality of student learning, air quality also affects the health of teachers. This was proven by Tuula Putus in her research which stated that air quality had a significant effect on the hoarseness experienced by teachers in Finland (Putus, Vilén, and Atusuo, 2024).

Table 2. KTR Compliance Results & Air Quality Measurements in the Workplace

Workplace	Meets Air Quality Requirements	%	Does not meet air quality requirements	%
Comply with KTR	6	54.55%	0	0.00%
Not Complying with KTR	6	54.55%	3	27.27%
N	**15**			

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Measurements in the Workplace

In the workplace, it was found that 6 out of a total of 15 workplaces were KTR compliant and met air quality requirements. 6 workplaces do not comply with KTR but meet air quality requirements. In workplaces that do not comply with KTR but meet air quality requirements, violations are found in the form of smokers smoking outside designated smoking areas (violators smoke in the yard or parking lot). The provision of ashtrays outside designated smoking areas and the discovery of scattered cigarette butts also indicate that visitors and employees still do not comply with the KTR by not smoking in designated areas. 3 workplaces do not comply with KTR and do not meet air quality requirements. In these 3 workplaces, violations were still found in the form of smokers smoking outside designated smoking areas. However, violations were found both outdoors and indoors. Apart from that, ashtrays were still found outside designated smoking areas and the discovery of scattered cigarette butts also indicated that visitors and employees were still not complying with the KTR by not smoking in designated areas. Even though the workplace already has a special smoking area that complies with the regulations. It was found that in the room measured using a particulate meter the highest PM 2.5 measurement reached 1449 µg/m^3, the highest PM 10 reached 277 µg/m^3 but the air flow was found to be good.

In the KTR Regional Regulation no. 5 of 2014 article 4 paragraph 3 states that the person responsible for the workplace provides a special smoking area as stipulated in article 5. However, in the 9 places that do not comply with the KTR, neither visitors nor employees still use the special smoking areas provided. This is proven by the fact that ashtrays, butts, and people smoking outside the designated areas were still found. Not to mention that the PM 2.5 and PM10 levels in 3 places that do not meet indoor air quality standards have very high values. In research conducted by Wu J et al, an increase in PM 2.5 exposure levels of 10 µg/m^3 for 25 days caused a decrease in productivity of 1%. Apart from affecting work productivity, PM10 particles can be inhaled and deposited throughout the airways in the upper part of the lungs (Wu *et al.*, 2021). Particles that stick to the surface of the lungs can cause tissue damage and lung inflammation, thereby impacting respiratory and cardiovascular health. Apart from affecting employee stress levels. Research conducted by Huichu et al in 2017 showed that higher PM can cause metabolic changes consistent with activation of the hypothalamic-pituitary-adrenal and sympathetic-adrenal-medullary axes, thereby adding potential mechanistic insight into the adverse health impacts associated with PM. Additionally, our research showed a short-term decrease in stress hormones after indoor air purification (Hiuchu Li. 2017). Which means that there is a link between increased stress hormones when a person is consistently exposed to Particulate Matter.

Table 3. KTR Compliance Results & Air Quality Measurements in Public Places

Public places	Meets Air Quality Requirements	%	Does not meet air quality requirements	%
Comply with KTR	11	45.83%	4	16.67%
Not Complying with KTR	5	20.83%	4	16.67%
N	**24**			

Of the 50 public places, 24 of them are public places consisting of star hotels, budget hotels, food processing places (Restaurants & Cafes), and airports. From the results of observations and air quality inspections, it was found that 11 public places met air quality requirements and complied with the KTR, including 2 star hotels, 5 budget hotels and 4 food processing places. It was found that 5 public places met air quality requirements and did not comply with KTR, including 1 star hotel, 1 budget hotel and 3 food processing places. Of the 5 places where KTR is violated, the ones that are most often violated are the provision of smoking places that do not comply with the provisions, the provision of ashtrays outside the designated places and the sale of cigarettes in eating places. It was

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found that 4 places did not meet air quality but complied with KTR, including 2-star hotels and 2 food processing places. In star hotels, rooms were found where PM 2.5 exceeded the quality standard and 2 food processing places where PM 2.5 and PM10 exceeded the threshold because there were cooking areas in the same room. Four public places were found that did not meet air quality requirements and did not comply with KTR, including 1 budget hotel where PM 2.5 and PM 10 exceeded quality standards, cigarette butts were found, and people were found smoking outside the designated places. It was also found that 3 food management places with PM 2.5 and PM 10 exceeded quality standards and violations in the form of smoking places that did not comply with regulations.

In hotels and food management places, air quality can determine a person's intention to visit again through perceived value, perceived quality, and affective image (Park, 2021). So air quality needs to be a serious concern, especially in hotel rooms and the provision of special smoking areas in closed areas. Much research evidence shows that pollutants, especially fine particulate matter (PM2.5), associated with smoking, are harmful to the human body. Considering that hotel rooms and indoor smoking areas are almost airtight and not too spacious. Investigations conducted in China found that cigarette combustion and smoking-induced PM2.5 concentrations can reach an average of 586 µg/m3 and 1368 µg/m3, respectively, when indoor ventilation is turned off. Ventilation operation can reduce concentrations to about 100 µg/m3. The effectiveness of opening windows as a mitigating measure is highly dependent on outdoor PM2.5 concentrations; The observed reference threshold was 100 µg/m3. The air purifier tested worked well for smoking, but not for burning cigarettes (Wilco Chan.2017). Regarding the discovery of smoking places that do not comply with the provisions, according to Kulon Progo Regional Regulation No. 5 of 2014 concerning KTR article 4 paragraph 4. Special smoking places as intended in paragraph (3) must meet the requirements: they are open places that are in direct contact with outside air; physically separated and located outside the main building; closest to 5 (five) meters from the entrance and exit; and the closest 5 (five) meters from the passing area. However, in the findings of this study, smoking areas were found to be closed and not in direct contact with outside air. In indoor smoking areas, especially in airport areas where open space is very limited, *exhausts are provided,* but *the exhaust* provided cannot suck up the smoke in the smoking room. This causes cigarette smoke to gather in the room and when the smokingroom door is opened a leak occurs which causes an increase in the PM meter around the room.

CONCLUSION

The results of the KTR sample data collection illustrate that KTR compliance has a positive effect on air quality with a significance value of 0.48. The dominant violations found in the sample area were the provision of ashtrays, the discovery of cigarette butts, people smoking outside designated areas, and there were still designated smoking areas that did not comply with regional regulations. The findings of violations regarding the provision of smoking places in the room greatly affect the levels of PM 2.5 and PM 10 in the smoking room and the rooms around the smoking room. Exposure to air pollution such as PM that exceeds the threshold can cause health problems and reduce productivity and health, both physical and mental. So implementing optimal KTR regulations can improve indoor air quality. Consistency is needed from the person in charge of the area in monitoring the implementation of KTR through the activation of the KTR task force to increase compliance along with monitoring environmental health. This needs to be done to improve air quality so that it can improve the health and productivity levels of students, employees, and the community. In future research, attention needs to be paid to repeating indoor PM measurements over time and increasing the number of samples studied to improve data quality.

REFERENCES

CDC. (2020b) Smoking and tobacco use: Health effects. Available at: [Accessed 1 April 2024]

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EPA, "Indoor Air Plus," 2012.) [Online]. Available: http://www.epa.gov/indoorairplus/

GBD 2019 Diseases and Injuries Collaborators. (2020). Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet.;396(10258):1204-1222.

Gilliland, F.D. et al. (2001) 'The Effects of Ambient Air Pollution on School Absenteeism due to Respiratory Illnesses', Epidemiology. Epidemiology, 12(1), pp. 43–54. doi: 10.1097/00001648-200101000- 00009

Huichu Li, MS*, Jing Cai, PhD*, Particulate Matter Exposure and Stress Hormone Levels A Randomized, Double-Blind, Crossover Trial of Air Purification. AHA Journal Circulation. Volume 136, Issue 7, 15 August 2017; Pages 618-627 https://doi.org/10.1161/CIRCULATIONAHA.116.026796

Jimenez, R. and Jordan, F. (2019) 'Air Pollution and Academic Performance in School Children: Preliminary Results from A Longitudinal Study in Chile', Environmental Epidemiology. Ovid Technologies (Wolters Kluwer Health), 3, p. 184. doi: 10.1097/01.ee9.0000607832.1378 9.a9.

Kulon Progo Regency Regional Regulation (Perda) no 5 of 2014 concerning non-smoking areas.

Law no. 17 of 2023 concerning Health

Meteorology, Climatology and Geophysics Agency. PM2.5 Concentration [Internet]. 2019. Available from: https://www.bmkg.go.id/kuulasi-air/information-partikulat-pm25.bmkg?lang=EN

Minister of Health Regulation Number 2 of 2023 concerning Implementing Regulations of Government Regulation Number 66 of 2014 concerning Environmental Health.

Mukhtar R, Hamonangan Panjaitan E, Wahyudi H, Santoso M, Kurniawati S. Chemical components of PM2.5 and PM10 in ambient air in Serpong - Tangerang. J Ecolab. 2013;7(1):1–7.

Mukono HJ. Air pollution and its effect on respiratory disorders. Surabaya: Airlangga University Press; 2003.p.1-3

Park J, Yoo JL, Yu J. Effect of Hotel Air Quality Management on Guests' Cognitive and Affective Images and Revisit Intentions. Int J Environ Res Public Health. 2021 Sep 4;18(17):9346. doi: 10.3390/ijerph18179346. PMID: 34501936; PMCID: PMC8431611.

Perbup no. 3 of 2015 concerning Guidelines for the Implementation of Kulon Progo Regency Regional Regulation No. 5 of 2014 concerning No-Smoking Areas

PM10 in Classroom Air with ARI Events in Elementary/MI Students in the Cilebut Community Health Center Working Area, Sukaraja District, Bogor Regency, 2018. National Journal of Global Environmental Health (JNKLG). Vol. 1 Issue 2. University of Indonesia. 2020. Jakarta.

PP Number 109 of 2012 concerning Safeguarding Materials Containing Addictive Substances in the Form of Tobacco Products for Health

Putus, T., Vilén, L., and Atusuo J. (2024) 'The Association Between Work-related Stress, Indoor Air Quality and Voice Problems Among Teachers - Is There a Trend?', *Journal of Voice*, 38 (2), pp 541.e21-541.e29. doi: https://doi.org/10.1016/j.jvoice.2021.09.007

P2PTM Ministry of Health of the Republic of Indonesia. 2018. Beware, Cigarette Poison Sticks to Furniture and Its Dangers! - P2PTM Directorate. [online] Available at: [Accessed 31 March 2024]

Regulation of the Minister of Education and Culture (Permendikbud) of the Republic of Indonesia Number 64 of 2015 concerning KTR in the School Environment

Regulation of the Minister of Health of the Republic of Indonesia Number 2 of 2023 concerning Implementing Regulations of Government Regulation Number 66 of 2014 concerning Environmental Health

Siburian, S. (2020). Air Pollution and Greenhouse Gas Emissions. https://www.google.co.id/books/edition/Pencemaran_Udara_dan_Emisi_Gas_Rumah_Kac/FRsMEAAAQBAJ?hl=en&gbpv=0

Weng J, Xia B, Zhao Y, Song Q. The Synergistic Effect of PM2.5 and CO2 Concentrations on Occupant Satisfaction and Work Productivity in a Meeting Room. Int J Environ Res Public Health. 2021 Apr 13;18(8):4109. doi: 10.3390/ijerph18084109. PMID: 33924624; PMCID: PMC8069632

Received: 07-06-2024, Accepted: 08-07-2024, Published Online: 01-08-2024

Wilco Chan Dr. a, Prof. Shun-Cheng Lee b, Dr. Danny Li c, XingQi Kikky Chen a; *Cigarette induced PM2.5 in hotel rooms: An assessment of the effectiveness of management's mitigating measures; International Journal of Hospitality Management* Volume 60, January 2017, Pages 42-47.

World Health Organization. Global Youth Tobacco Survey (GYTS). Indonesia report 2014. Who-Searo. New Delhi; 2014

Received: 07-06-2024, Accepted: 08-07-2024, Published Online: 01-08-2024