PROCEEDING

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MAY 30 AND JUNE 1, 2021

THE IMPACT OF COVID-19 ON SUSTAINABLE DEVELOPMENT OF CITIES AND SETTLEMENTS

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POSTGRADUATE PROGRAM
UNIVERSITAS KRISTEN INDONESIA
2021

PROCEEDING

THE IMPACT OF COVID-19 ON SUSTAINABLE DEVELOPMENT OF CITIES AND SETTLEMENTS

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PREFACE

Praise the Lord, God Almighty, for His wisdom and grace that the proceedings of the International Webinar with the theme "The Impacts of Covid-19 on the Sustainable Development of Cities and Settlements" can be finished. The Postgraduate Masters Program held the webinar in Architecture, Christian University of Indonesia, and the International Office of UKI Jakarta.

The webinar is divided into two days, the first on Friday, April 30, 2021, and the second on Saturday, May 1, 2021.

The preparation of this proceeding is intended so that the wider community can find out various information related to the implementation presented in the international webinar. The presenters of the international seminar include:

1. Dr. Fang Yenn Teo, from The University of Nottingham, Malaysia
2. Arch. Jemielyn G. Siapno, from DMMMSU, The Philippines
3. Prof. Ir. Johannes Widodo, M.Arch., Ph.D., from NUS, Singapore
4. Prof. Dr. Charles O.P Marpaung, M.S., from Universitas Kristen Indonesia
5. Prof. Dr.-Ing. Ir. Uras Siahaan, lic.rer.reg., from Universitas Kristen Indonesia
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7. Dr. Yophie Septiady, S.T., M.Si., from Universitas Kristen Indonesia
8. Dr. Ramos P. Pasaribu, S.T., M.T., from Universitas Kristen Indonesia
9. Dr. Posma S.J.K Hutasoit, S.T., S.E., M.Si., M.SE., from Universitas Kristen Indonesia
10. Leonard Lisapaly, M.Si., Ph.D., from Universitas Kristen Indonesia

We express our gratitude and highest appreciation to the authors and speakers who have contributed their thoughts to this international webinar. We would also like to thank our review partners, editors, and publishers of UKI Press. They have reviewed and maintained the paper quality to be worthy and accounted for the preparation of this proceeding. Finally, we would also appreciate the webinar participants for their attending the webinar event.

Lastly, I hope this proceeding can contribute benefits for all parties, especially for developing the world of architectural education.

Jakarta, May 2021
Chairman of the committee,

Dr. Ramos P Pasaribu, ST., MT.

OPENING SPEECH

Assalamualaikum warahmatullahi wabarakatu
Salam Sejahtera bagi Kita Semua atau *Shalom* "Damai"
Om Swastyastu
Namo Buddhaya
Salam Kebajikan

Honorable Speaker,

Prof. Ir. Johannes Widodo, M.Arch., Ph.D
Prof. Fang Yenn Teo
Arch Jamielyn G. Siapno
Prof. Dr.-Ing. Ir. Uras Siahaan, lic.rer.reg.
Prof. Dr. Ir. James E.D Rilatupa, M.Si
Prof. Dr. Ir. Charles O.P Marpaung, M.S
Dr. Yophie Septiady, S.T., M.Si
Dr. Ramos P. Pasaribu, S.T., M.T
Dr. Posma S.J.K Hutasoit, S.T., S.E., M.Si., M.SE
And all participants

The honourable Mr. Chairman of the Committee, Prodi Magister Arsitektur Program pascasarjana UKI, International Office UKI and all of audience who has participated in this conference.

Ladies and gentlemen, I believe that all of you will do a great discussion through the two days Conference. It is my great pleasure that you will had fruitful discussions though I think two days is not enough.

I expected that every participant to make a presentation about "The impact of covid-19 on the sustainable developement cities and settlement" would develop our capacity in writing and strengthen the competitiveness of our university and country.

I wanted you to understand the difference and promote mutual understanding among the participants through the conference.

I would like to pay my deep respect to all the participants for your positive participation in the conference.

I hope that what we have learned through the conference will help us a lot in our duties to build the nation, culture and humanity through high webinar

I hope we can meet again in the next seminar

Finally, on behalf of Universitas Kristen Indonesia, I would like to express my appreciation to all the participants for taking time out of your busy duties to participate and to all your organizations for sending excellent participants to the conference.

I would like to close my remarks and officially announce the **opening** of this webinar wishing the future prosperity of all us. God bless all of us

Thank you for your attention.

DR. Wilson Rajagukguk, MSI., MA Ministry
Vice Rector for Academic Affairs, Universitas Kristen Indonesia

PREVENTION OF COVID-19 TRANSMISSION IN OFFICE INTERIOR DESIGN

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ABSTRACT

In the current era of the COVID-19 pandemic, environmental conditions and available supporting facilities are crucial factors for the community. Good indoor environmental quality conditions can prevent users from sick building syndrome. Meanwhile, most human activities are carried out in the inner space. Every day 18-20 hours are spent on activities in the office, car, school, or home. Recently, researchers highlighted the potential for much higher rates of COVID-19 infection in a closed environment with recirculated air. For the current COVID-19 pandemic, closed air circulation is discouraged. Therefore, increasing ventilation or filtration is the solution to a healthy indoor environment during this COVID-19 pandemic. To prevent the spread of COVID-19 in the workplace, we keep the workplace clean and hygienic. Surfaces (such as benches and tables) and objects need to be wiped with a disinfectant periodically.

Keywords: ventilation, maintenance

INTRODUCTION

The COVID-19 pandemic in the world since 2020 until now is included in the category of non-natural disasters. Despite the enormous health impacts, there are significant economic losses to households, companies, and governments and a massive disruption to life and livelihoods. The result of the lockdown or in Indonesia is referred to as LSSR (Large Scale Social Restrictions), disrupting the food distribution chain and a sharp decline in commercial activities. In addition, the recommendation for physical distancing issued by the Indonesian government prevents people from leaving the house and not doing their usual activities. So that indirectly has a significant impact on environmental changes during the lockdown. In line with this, the President of the Republic of Indonesia designated COVID-19 as a National Disaster. ASEAN has been actively restructuring and using existing regional health mechanisms to try to have a coherent response to these impacts (Riyanti et al., 2020). Therefore, the government needs to recommend providing knowledge and knowledge in understanding disasters and health-related emergency risks (Riyanti et al., 2012).

In the current era of the COVID-19 pandemic, implementing strict health protocols and living in a residential environment or a place for healthy activities is the best solution for the community. This healthy environment is the safest and most comfortable place amid the escalation in the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19, which has become a global pandemic (Muhyiddin, 2020). Environmental conditions and available supporting facilities are crucial factors for the community. Therefore, living in a good environment and occupying a healthy and comfortable residence is very helpful as a refuge in the face of a pandemic like this time. This step is important to carry out considering that there are no drugs that have been empirically proven to be able to cure Covid-19 sufferers until now.

Good interior environmental quality conditions can prevent users from sick building syndrome (Masoud *et al.*, 2017). Therefore, it is necessary to study the quality of the interior environment to create a healthy environment that leads to the health of its users (Konstaninos and Nikolaos, 2015). Nowadays, humans have adapted by considering the world of rooms in buildings as their natural environment. Thus, building facilities should be made with the importance of providing a quality interior environment for all occupants and building users.

The cleanliness of the interior in the workplace can increase productivity. It increases the satisfaction of the workers as a whole and a stronger work ethos (culture). No one wants to work in a dirty office environment. In fact, according to a 2017 healthy hand-washing survey, it was clear that 89 percent of Americans believe the conditions of workplace toilets are one indicator of how companies value their workforce. Regular cleaning of toilets and other important workplace areas will ensure that hygiene remains at the forefront and does not go unnoticed by employees and visitors (Mirte *et al.*, 2017). It also makes employees at the workplace happier (Theodora *et al.*, 2019). Additionally, a 2015 study found employees to be 12 percent more productive (Masoud et al., 2017).

Facility management is a function within the organization that manages the building (including building maintenance) and the people in the building. Building maintenance is the effort and action required to maintain the condition of the building and its facilities so that it is following the technical specifications and the service life of the building's original planning. Building maintenance is a continuous process to balance services and costs to provide a sense of security, comfort, and satisfying building users. This paper aims to reduce the spread of the COVID-19 virus in the activities of workers in the space in their work environment with building facility management.

QUALITY OF INTERIOR ENVIRONMENT AND USER HEALTH

When designing a building, it is often forgotten that the success rate of a design project can be measured from the quality of the indoor environment. Healthy and comfortable can increase the productivity level of the occupants (**Figure 1** and **Figure 2**). Unfortunately, these benchmarks are often ignored because it is easier to focus on cost reduction issues than on increasing the productivity and health of occupants (Nurul *et al.*, 2016). Meanwhile, most human activities are carried out in the interior. Every day 18-20 hours are spent on activities in the office, car, school, or home (**Figure 3**). Therefore, paying attention to the interior quality is very important (Anonym, n.d.). The quality of the interior is not only assessed in terms of comfort but also environmentally friendly.

The interior is a container used by humans for activities. It is formed from barriers in the building. The movement or circulation spaces in the interior are formed through its filling elements. In achieving a good quality of the interior, considerations must be formed through limiting, filling, and complementary elements that include room size, spatial shape, room environmental quality, and space content (Yasmin *et al.*, 2020). The room dividing element has two functions, the main functions of which are:

a) Prevention of penetration of air, sound, light, air pollution, and dust pollution;
b) Selection of the transmission of environmental factors (light, sight, sound);
c) Define the territory; and
d) Security (fire, wild animals, natural hazards, humans and machines).

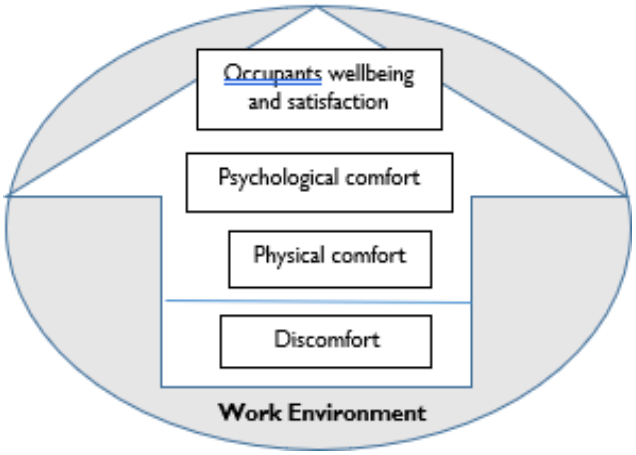

Figure 1. Model of Achieving Environmental Comfort for Occupant (source: Esfandiari*et.al.*, 2017)

Meanwhile, the second function of the room dividing element, namely:

(a) supporting the building structure,
(b) where to install the complementary elements, and
(c) where to place the filler elements.

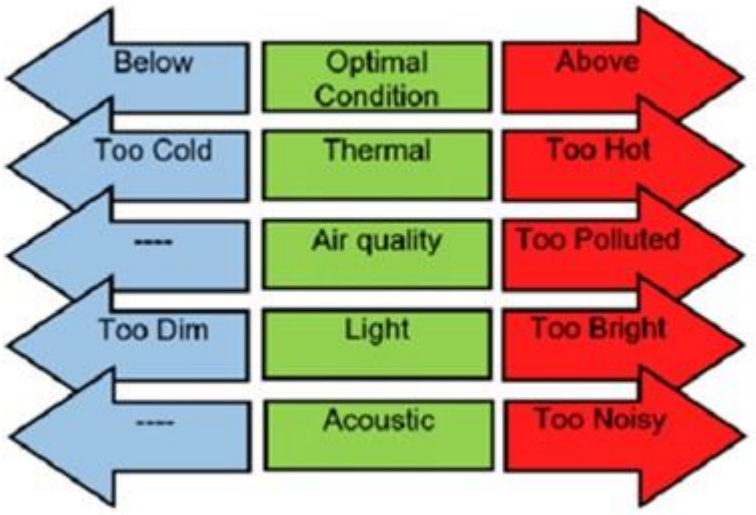

Figure 2. The Effect of Not Optimizing Condition on Occupants in the Indoor Environment ofBuilding (source: Esfandiari *et.al.*, 2017)

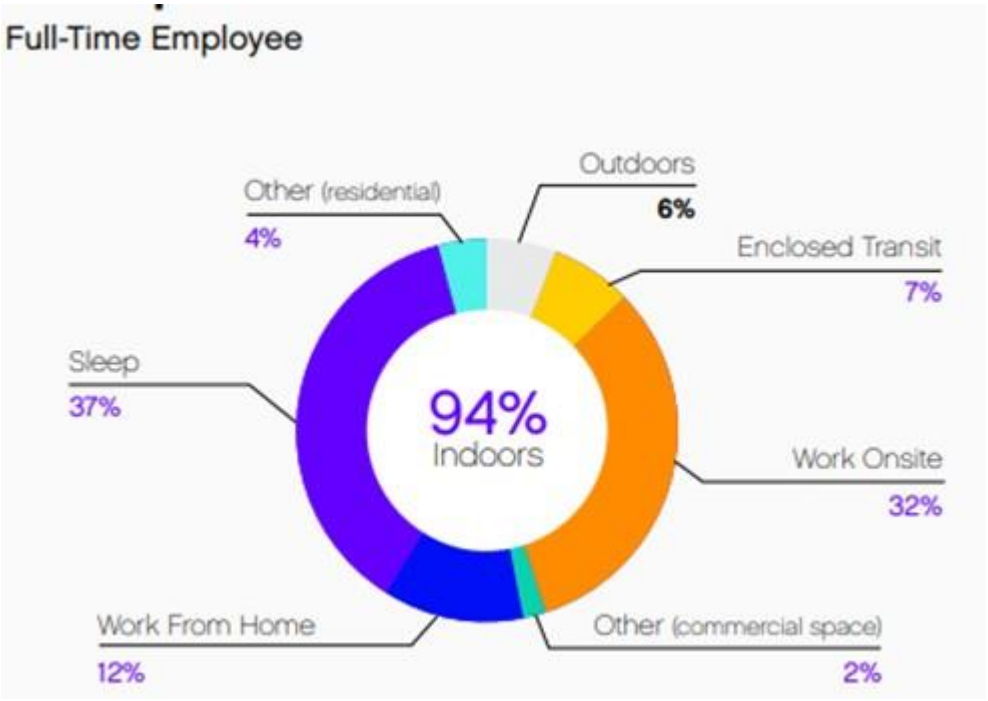

Figure 3. Indoor time for a full-time employee (source: Anonym, n.d.)

According to the indoor environment handbook, IEQ (Indoor Environment Quality) covers four main factors: indoor air quality (IAQ), thermal comfort, lighting quality, and acoustic quality (Bluyssen, 2009). Each is measured by a set of parameters with multiple control methods and related problems, as presented in Tables 1 (I.W.B. Institute, 2018 and ASHRAE, 2017).

Table 1. IEQ Factors, Parameters, Control Methods, Issues, Threshold, and Health Effects

IEQ Factors	Parameters	Control Method	Issues	Parameter Measures	Threshold	Health Effects
IAQ	Pollution sources Ventilation rate and efficiency	Source control Ventilation system maintenance	Pollution Fine dust	PM2.5	15 μg/m^{3*}	Respiratory and cardiovascular disease including asthma, myocardial ischemia, high blood pressure and heart disease
				PM10	50 μ/m*	
				CO_2	800 ppm*	Increased risk of sick building syndrome symptoms such as headache

				TVOCs	312 ppb*	Dry throat, runny nose, asthma attack, poisoning, and cancer
Thermal Comfort	Temperature Relative humidity Air velocity User activity	Air conditioning system Building design	Adaptation Building integration Energy use	Temperature	24°C - 26°C**	Respiratory problems
				Relative Humidity	65% - 80%**	Microbial growth, skin drying, irritation or mucus membranes, and dry eyes
Lighting Quality	Luminance Reflectance Color, temperature View, and daylight	Luminance distribution Artificial lighting and daylighting integration	Daylight relation to thermal comfort Energy use	Lux level	300 – 500 lux*	Headache, circadian phase disruptions, breast cancer, sleep disorder, and depression
Acoustical Quality	Sound level Absorption Sound insulation Reverberation time	Acoustical control Passive noise control Active noise control	Vibration and annoyance Long term health effects	Sound level	55 dBA*	Hypertension, stress, poor concentration, memory retention, and mental arithmetic

* WELL Building standard
** ASHREA 55

Indoor air quality is an important factor for assessing interior environment quality. Identifying indoor sources of pollutants can significantly reduce risks to human health and well-being. The building ventilation system is perhaps an important and often underestimated aspect of interior air pollution levels. So, the design and maintenance of the air ventilation system is a vital matter that needs to be paid attention to. Meanwhile, thermal comfort is a subjective evaluation of one's satisfaction with the thermal environment in the room. Perception from one person to another can differ according to various factors such as age and gender. In general, thermal comfort is the factor most responsible for human health, well-being, and productivity as it directly affects the body's respiratory system. For example, extremely cold or high-temperature fluctuations can trigger asthma and flu symptoms.

Maintaining a comfortable lighting level is essential in a work environment. The main lighting issues need to be addressed and avoided from glare, flickering, reflections, uneven light distribution, and integration lack of natural and artificial lighting. On the other hand, when the lighting level is comfortable, it can create a comfortable work environment, increasing work productivity—in addition, having user control capabilities further improve the quality of interior space lighting.

To make the interior environment perform acoustically better, we implement control strategies to limit unwanted noise and echo. Simple strategies involve using absorbent materials, sealing sound leaks, reducing sound transmission contact, and implementing active noise control. Prolonged exposure to annoying sounds can lead to various health problems such as stress, poor concentration, loss of productivity at work, and communication difficulties.

By focusing on the experience of building occupants/users, elements of interior environmental quality should be dynamically combined and optimized. It aims to meet the uniqueness of the needs of each individual from the occupants/users of the building. Meanwhile, from this interaction, a complex and interdependent system is created. Therefore, it is important not to focus on one element at the expense of another. Tactics or means such as increasing ventilation or filtration as a solution to a healthy

interior environment have been widely touted during the COVID-19 pandemic; this strategy alone may not be the best solution, but it can be a useful one.

In addition, job satisfaction is a scale to measure how much people love their jobs and their various aspects. Some researchers define job satisfaction as a feeling that results from comparing the actual, desired, and expected results of a job. In job satisfaction, motivation is a key principle, which is closely related to need. Needs, both basic and related to the value system, lead to their respective goals; motivation is needed to achieve goals. Job satisfaction is the relationship between motivation theory and its implementation in the workplace and thus is an important factor for organizational success. Satisfied employees usually work more and show higher productivity levels, which indicates that satisfaction is related to the level of organizational effectiveness, both private and public (Theodora *et al.*, 2019).

CONTROLLING THE POTENTIAL TRANSITION OF COVID-19 IN THE AIR

Some of the recent findings support the hypothesis that air pollution may increase susceptibility to SARS-CoV-2 infection (Filippini *et al.*, 2020). Previous research has identified various indicators of interior environmental quality, including IAQ, thermal comfort, and visual and acoustic conditions (Bhin, 2020). It is hypothesized that the quality of the interior environment mediates the impact of the built environment on occupant health. Accumulated interior air pollutants appear to contribute significantly to sick building syndrome. Thus, occupants of buildings in greener and healthier environments are more likely to live in better health conditions (Isabelle and Anita, 2018). **Figure 4** shows the interrelated relationship between environmental health and expected outcomes and impacts. As the figure shows, many approaches work together for the same outcome regarding occupant health.

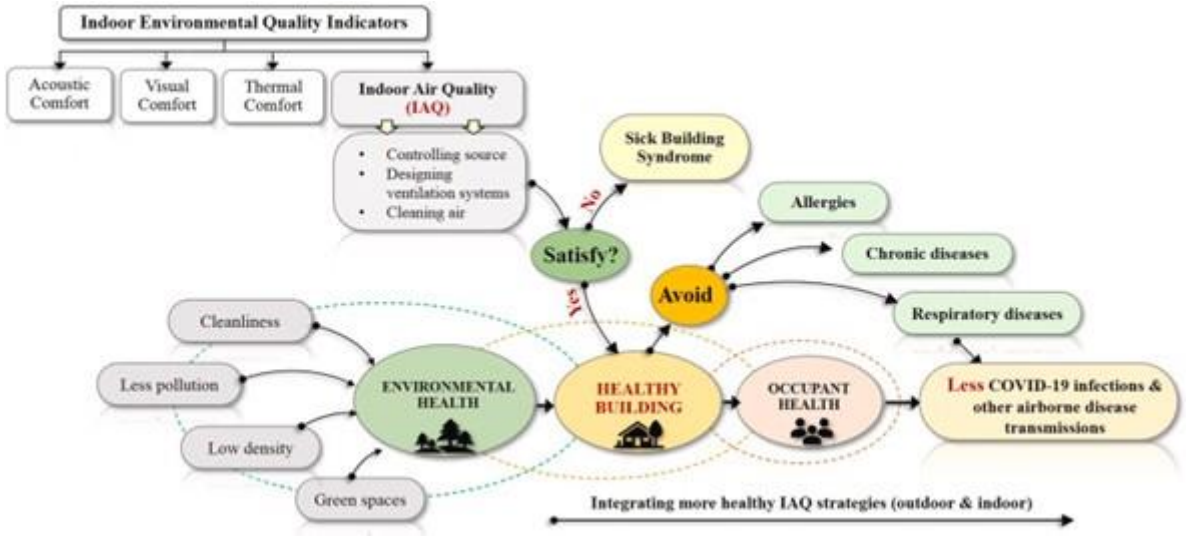

Figure 4. The Intertwined Relationship Between Environmental Health and the Expected Impacts on Human Health. (source: Megahed and Ghoneim, 2020)

Awareness of emerging new diseases serves to emphasize the need to design interior environments that can prevent cross-infection. The literature provides strong evidence of an association between ventilation and control of airflow in buildings, transmission, and the spread of infectious diseases (Isabelle and Anita, 2018). Recently, researchers highlighted the potential for much higher rates of COVID-19 infection in a closed environment with recirculated air. Therefore, for the current COVID-19 pandemic, air circulation is discouraged.

Ventilation is an engineering control strategy for diluting and removing airborne contaminants and is closely related to IAQ. It also plays an important role in promoting the comfort and health of the building occupants. Poor ventilation has been identified as a precursor to many respiratory disorders. Ventilation can be driven by a mechanical system, natural style, or a combination of both. Mechanical ventilation can cause energy efficiency problems, whereas the outdoor environment limits natural ventilation. The hybrid ventilation function makes use of both (Isabelle and Anita, 2018). The best strategy would seek effectiveness in removing contaminants but also with low energy costs.

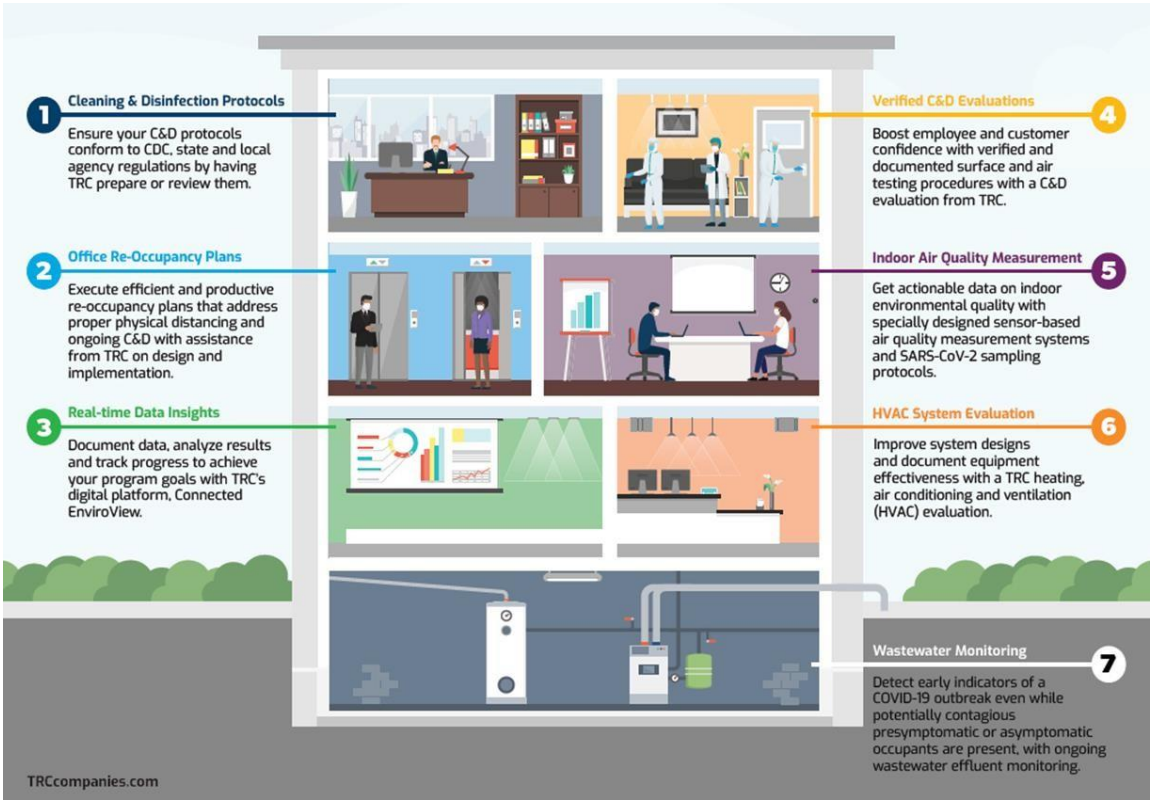

Figure 5. Health Protocols and Indoor Environment Quality (source: dailynews, 2019)

Airborne transmission of COVID-19 in interior environments increases if restrictions are relaxed and measures are most effective such as no social distancing and self-isolation. Based on this situation, the pandemic raises awareness of the importance of clean air and surfaces (Bradley, 2020). There are many areas of potential infection in buildings, including sick or sick building syndrome or circulating air through HVAC (Heating, Ventilation, and Air Conditioning) systems. Efforts have been made to find engineering techniques to keep airborne pathogens away from populations or keep them low not to cause disease. However, most of the existing building designs have not implemented the air conditioning concept, reducing the virus concentration in the interior. Buildings that use air conditioning in the room are recommended to open windows to enter as much air as possible so that the concentration of the COVID-19 virus decreases. In addition to saving on the use of air conditioning, the incoming light can also reduce lights. Air conditioning and lighting are some important principles in conserving energy.

The decrease in virus concentration can occur by dissolving it by the outside air, filtered first with the Minimum Efficiency Reporting Value 13 (MERV13) filter medium (90% efficiency for 0.5micron particles), and if possible, run continuously for 24 hours every day. in one week. MERV13 filters are commonly used in hospitals to treat contaminants like bacteria, droplet nuclei (sneeze), cooking oil, most smoke and insecticide dust, most face powder, most paint pigments. In addition, the public can

install a portable air cleaner equipped with a HEPA (High-Efficiency Particulate Air) filter. The HEPA filter is a mechanical air filter that works by filtering dust, cigarette smoke, animal hair, and others in the air). However, HEPA filters actually cannot prevent the spread of the COVID-19 virus on a large scale. Because basically, this type of filter can only protect certain conditions. The following are tips that can be done to reduce the concentration of the virus in the room:

a. Remove/suck air around the source by installing the exhaust fan in the room. The exhaust fan is installed with a HEPA filter so as not to contaminate the environment.
b. Dissolve the virus concentration in the room by introducing fresh/outside air that has been conditioned (filter, temperature, and reduced moisture content) using DOAS (Dedicated Outdoor Air System).
c. Filter the air in the room using an Air Purifier equipped with a HEPA filter. It would be perfect if a Corona Plasma Air Purifier could kill and destroy bacteria and viruses other than VOCs (Volatile Organic Compounds), HVOCs (Hazardous, and filter PM2.5 and PM10 particles.

CLEANLINESS OF INTERIOR ENVIRONMENTAL

Maintenance and care are a form of activity carried out to keep a building in a ready-to-use state or to take steps to make repairs until the building's condition can be used again. Maintenance that is carried out regularly and periodically will minimize maintenance of the building in the long term. Maintenance is a preventive step, namely actions on buildings that are carried out routinely and can also be carried out at certain intervals with several predetermined criteria (Department of Public Works, 2008). Maintenance is divided into:

a. Routine maintenance is a maintenance activity that is carried out continuously, both daily/weekly/monthly; some examples of routine maintenance activities include:
   - Cleaning the floor of the room; sills and windows, ceiling, and walls;
   - Cleaning of toilets, bathtubs, floors, and walls of toilets, laboratory tubs;
   - Cleaning gutters and dirty drains;
   - Cleaning sewers.

b. Periodic maintenance is an action step on a building according to a predetermined periodization. Some examples of activities include:
   - Wall repair and painting;
   - Repair and painting of door and window frames;
   - Replacement of tiles or other roof coverings;
   - Service and the addition of freon gas to the AC unit;

Since the outbreak of COVID-19, to avoid the spread of COVID-19, most activities carried out online. For example, activities at work and school carried out together in a room are now online using zoom applications. With the enactment of the new normal, all activities carried out outside the home while adhering to health protocols that have been regulated by the government, namely wearing a mask when leaving the house, washing hands frequently with soap, and maintaining distance and avoiding crowds to prevent transmission of COVID-9. Now, the new normal protocol has been released by the Ministry of Health on Monday, May 25 2020, based on the Decree of the Minister of Health Number HK.01.07/MENKES/328/2020 concerning Guidelines for the Prevention and Control of COVID-19 in the Office and Industrial Workplaces in Supporting Business Continuity in Situations Pandemic (Minister of Health of the Republic of Indonesia, 2020). The health protocol in question includes maintaining hand hygiene, wearing a mask when leaving the house, maintaining distance, and maintaining health by eating food and exercising.

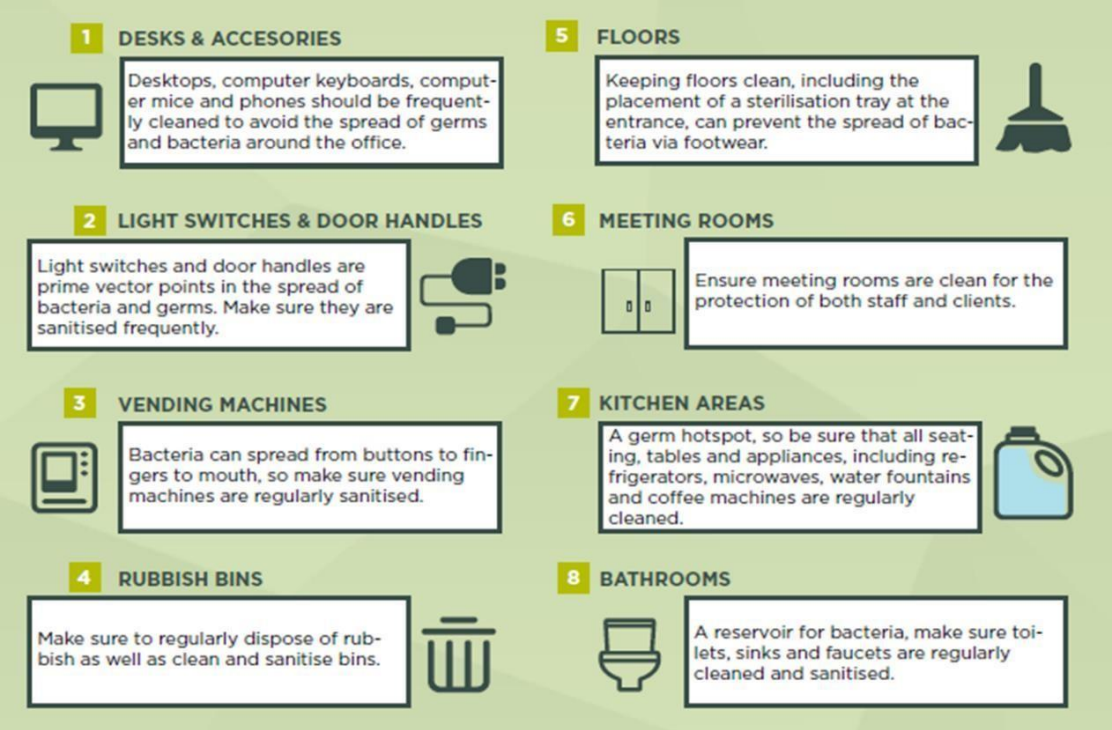

Figure 6. Cleanliness of the Workspace Environment (source: Mirte *et.al*, 2018).

Simple ways to prevent the spread of COVID-19 in the workplace are to keep the workplace clean and hygienic; the Ministry of Health and WHO recommended them. Surfaces (such as benches and tables) and objects need to be wiped with a disinfectant periodically. So it is because contamination of surfaces touched by workers or guests is one of the main ways to spread COVID-19 (WHO, 2021). In addition, some things that need to be considered are:

- ✓ Clean the workspace and existing furniture regularly every day
- ✓ Provide hand-washing facilities with soap & water & hand sanitizer at work
- ✓ Creating a queue line with a safe distance when workers do attendance
- ✓ The attendance machine is sterilized regularly
- ✓ Perform cleaning with disinfectants in public areas and all work areas.
- ✓ Do not use carpets in company mosques, and ask workers to bring their respective prayer tools.
- ✓ Modifying the dining area into an individual space by providing a barrier or limiting the distance of the dining area for each worker
- ✓ Make modifications or adjust the layout of the workers' desks with a safe distance
- ✓ Adjusting the sewing machine layout to provide a safe distance between workers working in the sewing section.

A clean and suitable workspace can influence workers' perceptions of achieving high productivity goals. Generally, the most important character of IEQ (Indoor Environmental Quality) can be divided into two parameters, namely, the energy which usually affects human physiology, and that which affects human psychology (Konstatinos and Nikolaos, 2015. The study results highlight the aspects of cleanliness in the office environment that affect perceptions of productivity. This concern measured cleanliness. Employees evaluated their lower productivity at higher particle count levels in the ambient air in an office environment and when more dirt and stains were found on the surface (lower surface cleanliness). Regarding responding to these findings, it is advisable to carry out routine cleaning activities in the office environment where employees work (Isabelle and Anita, 2018). Overall, to maintain or achieve maximum personal productivity, a clean office environment is important, especially in the COVID-19 pandemic.

CONCLUSION

Building maintenance is a continuous process to balance services and costs to provide a sense of security, comfort, and satisfying building users. Thus, building facilities should be made with the importance of providing a quality interior environment for all occupants and building users. In achieving a good quality of the interior, considerations are needed to limit, fill, and complement the interior. It includes room size, room shape, the quality of the room environment, and the contents of the room.

Ventilation is an engineering control strategy for diluting and removing airborne contaminants and is closely related to IAQ. It also plays an important role in promoting the comfort and health of the building occupants. The current building design has not implemented the air conditioning concept to reduce the virus concentration in the interior. Buildings room with air conditioning is recommended to open windows to enter as much outside air as possible so that the concentration of the COVID-19 virus decreases.

Simple ways recommended by the Ministry of Health and WHO to prevent the spread of COVID-19 in the workplace include keeping the workplace clean and hygienic, surfaces (such as benches and tables) and objects that need to be wiped with a disinfectant periodically. It is because contamination of surfaces touched by workers or guests is one of the main ways that COVID-19 spreads.

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