

THE IMPACT OF COVID-19 PANDEMIC ON HOME SPATIAL DESIGN

Lim Su Ching¹ & Muhammad Faizal Bin Abdul Rani^{2*}

*Corresponding author

^{1,2}Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, Senior Lecturer, Universiti Teknologi Malaysia2

lim.ching@graduate.utm.my

*muhammadfaizal.ar@utm.my

Received: 16 November 2022

Accepted: 12 December 2022

Published: 31 March 2023

ABSTRACT

This literature review is aimed to identify the impact on home spatial design during the covid-19 pandemic. The covid-19 pandemic and the need to put people into lockdown, quarantine, and self-isolation at home require a reflection on the quality and capacity of home spatial to adjust to a specific function for they are not designed. The adjustment is to ensure the health and well-being of people during the pandemic and predict the future home spatial design for more human-centric. The qualitative method was conducted by viewing 50 papers and articles related to the pandemic, working from home, spatial design, residential real estate, habitability, and resilience from March 2020 to Dec 2021. The review indicates that the Covid-19 pandemic do influence the spatial design from the government enforcement of lockdown, fear of meeting people, and the “stay at home” lifestyle aspect. The pandemic increases people’s need to control their living space, safe space, and the use of home space. This review will not only be useful to safeguard people’s physical and mental health but with respect to the deficiencies and preferences of users about their homes. It can be taken as a starting point for updating the Malaysia development plans. In addition, it benefits real estate developers as a lifestyle reference on the design of healthy residential buildings in the future.

© 2023 MySE, FSPU, UiTM Perak, All rights reserved



Copyright© 2021 UiTM Press.
This is an open access article
under the CC BY-NC-ND license

Keywords: *Covid-19 pandemic, Quarantine, Spatial design, Habitability, Resilience*

INTRODUCTION

Since early 2020, the Covid-19 pandemic has been hitting the world up till today, and it is still not over yet. Approximately 437 million confirm cases globally and 5.96 million deaths cases was reported as of the day in 3rd March 2022 from World Health Organization (World Health Organization, 2022).

There is no clinical treatment for cure or prevention against Covid-19, social quarantine or more popularly known as lockdowns together with social distancing has become an almost standard protocol to stop the spread of Covid-19 across the world. When the number of Covid-19 cases started to rapidly increase during the second wave in Malaysia, Malaysia government took a similar approach to control the spread of Covid-19 (Jamal H, 2021). Movement Control Order was first implemented and forced by the Malaysia government on 18th March 2020 for 2 weeks, subsequently another 2 weeks into phase 3 and continued another 2 weeks on phase 4 onwards. Later on, Movement Control Order was converted into a Conditional Movement Control Order (CMCO) where the partial economic sector would be open as announced by the Prime Minister on 1st of May during Special Labour Day addressed (Lim, 2020). From 10th June to 31st August, Recovery Movement Control (RMCO) was activated after the CMCO.

Covid-19 infections are still ongoing and increasing in Malaysia, everyday an average of 27,804 new infections were reported. This is the highest daily average reported on 25th February which is 96% of the peak. Since the pandemic begin, there have been 3,468,590 infections and 32,827 coronavirus-related deaths reported in the country (Covid Now Malaysia, 2022). Due to the increase in infections, it has challenged the healthcare capacity all over the world including Malaysia. The daily cases of Covid-19 infections have stretched the ability to admit the patient to hospital or quarantine centre (Pusat Kuarantine dan Rawatan Covid-19 Berisiko Rendah-PKRC). In order to reduce the burden of health care system, Covid-19 Assessment Centres CAC have established in primary care

to assess and determine a care plan for Covid-19 cases to be monitored at home (Kementerian Kesihatan Malaysia, 2022). 80% of Covid-19 cases are producing or showing no symptoms can undergo treatment and quarantine at home with the strict monitoring by the health worker (The Straits Time, n.d.). With this implementation, people who tested positive for Covid-19, have symptoms of Covid-19 or who are close contact with someone with tested positive of Covid-19, need to be self-isolation and self-monitored during the period of time. In other words, people need to change the use of their home to be a house of self-isolation or self-monitoring place.

The percentage of people would spend average time in indoor is 90% (KLEPEIS, 2001) and 60% at home before the pandemic begin (IP Mark, 2016). Since pandemic is still ongoing, working from home or study from home become a challenge to Malaysian especially who are actively working during the Covid-19 outbreak. 67% among companies were still operating and required their staff to work from home during the pandemic (Jobstreet by seek, n.d.). At the same time, conventional teaching and learning have been replaced with online learning by considering the available technology devices, online learning platforms, and Internet connection at home (Noor Hazliezah Tamin, 2020) (Amir, 2022). So, it is a necessary for a person to stay at home most of the time to protect themselves and others from the virus infections.

It is confirmed that long period of isolation has had various effects on people's health. Mental health may have been seriously affected across the world, especially concerning feelings of loneliness, sadness and boredom (Brodeur, 2021). Negative psychological effects such as the symptoms of post-traumatic stress disorder, confusion and anger (Brooks, 2020). Sleep disorder is also another issue that was affected during the harsh period (Maestro-Gonzalez, 2021). Besides, health of children also affected by the lockdown. There are two issues, socioemotional complications and insufficient physical activity have been highlighted in the health of children of school (López-Bueno, 2021). On top of that, elderly with dementia having a high percentage of adverse outcomes due to staying at home (Caratozzolo, 2020). In conclusion, when people spend most of their time at home, the condition of home become an important factor in order to ensure the health and wellbeing of people during this extreme circumstance.

METHODOLOGY

The method of the data and information collection in this study is based on a state-of-the-art review of the literature on Covid-19 (Grant, 2009). Due to the rapid growing literature on Covid-19, the speed of information and data flow related to Covid-19 is extraordinary. This rapid growing lead to a process such that the sources not only from online resources such as scientific papers and article publication but including blogs, journals, news, policy and media reports. The literature was collected from March 2020 to Dec 2021. The data or review were focussed on the lessons learnt from the Covid-19 pandemic and its impact on residential design. Over 180 works of literature with keywords: impact of covid-19 pandemic, housing preference, work from home, resilience, habitability and spatial design were reviewed at the beginning of the research. Search platform included Google and University Technology Malaysia Library databases (Science Direct, Scopus, Web of science) were used. Sources were narrowed down to 40 papers that significantly built the discussion in the paper, alongside additional references. From this process, the study compiles the 3 main focus: Spatial dimension of home, the impact of Covid-19 pandemic towards spatial design and how past pandemic have influenced on home spatial design.

LITERATURE REVIEW

History of Pandemic

Looking back on history, pandemic have had a lasting influence on spatial design use and it is not the first time it happened in the history (Giacobbe, 2020). The impact of pandemic has affected people's lives, the changes of living generate by the risk of virus was reflected in our living environment. In 1800s, toilet facilities were moved from outdoor public places to a private indoor location during the infection disease outbreak. Material that uses in kitchen and bathroom have transformed from the soft decorative fabrics and carpet to hard material such as porcelain, tiles and linoleum. This evolvement is to minimize the risk of infection, pandemic has responded not only the types of spaces we created but also how we interact with the spaces (Kloncz, 2020). In late 19th and early 20th centuries,

architectural and design features could be found in our home today. For example, the stand-alone closet where we keep most of the clothing and related items transforms into built in furniture throughout the house to make room easier to clean. Another example was the powder room that was built on the ground floor of the house near the main entrance door are also the result of the attempt to prevent the spread of the infection disease in the early 20th century (Yuko, 2020). Another historic adaptation on residential space could safely experience sunshine and fresh air.

Central courtyards have been designed in Greek, Roman, Asian and Middle Eastern home design to serve as a safe access to expose to sunlight and outdoor environment. In order for people to experience the outdoor without being exposed to the virus where it could exit, the courtyard design have widely been adapted to be an enclosed outdoor space inside the house (Roux, 2020). By having a sufficient size of house (Amerio, 2020), the existence of outdoor space and greeneries (Mahsa Zarrabi, 2021), the green scenery (Giuseppina Spano, 2021) and the quality of indoor living space is a key determinant of a healthy person's quality life. During the Severe Acute Respiratory (SARS) occurred in 2003 in China and spread to 29 countries with 8422 cases (Cherry JD, 2004), the urgency of healthy residential building and public awareness were increased (Baldwin, 2006). One of the examples is resident in Amoy Garden, a housing complex in Hong Kong, where it had contacted SARS through the building's poor bathroom drainage and waste system. The virus transmits to units at the lower floors (LS, 2003) (Wu, 2020). Besides, low air quality in a room with poor ventilation will also increase the risk of transmission. However, air quality monitoring has only been applied in some countries such as Germany, Canada and UK (López, 2021). The previous infectious disease outbreak like the 1918 flu pandemic, tuberculosis and dysentery have made a few of our home design feature originated, widespread and popularized.

Impact of Pandemic on Lifestyle and Space at Home

Space has been a central research theme in architecture study. Its additional function as a physical shelter for the various activities of people and societies. Space is also a meaningful and informative form that expresses the transformations experienced by different societies' cultures and lifestyles, as well as social structures. It can be suggested that the unique

characteristics of a society exist in spatial systems. These knowledge were conveyed through the spaces themselves and the organization of spaces (Dursun, 2003). Space is an important aspect of architecture, where it creates a special relationship between function and social meaning in the building, meaning that the order of architectural space is actually the order of relations between people (Maryam AlKhateeb, 2021). A major life event can reshape what a person means to home, so home is not set in stone. The significant life events such as birth, marriage, death, migration or even pandemic may cause temporary or permanent remodelling of the home environment. Even the separation event of privacy and life or work could also cause the original meaning of 'home' to fall apart (Cieraad, 2019).

The condition of the space in the home is closely related to the socioeconomic status or social class of the occupants. In this regard, WHO also point out that there is also a direct link between quality of life and expectations and housing living conditions (Naglaa A. Megahed, 2020). This is verifiable evidence that both housing quality and housing space adequacy affect satisfaction. Lack of adequate spaces, patios and gardens leads to increased stress and aggression, especially among vulnerable groups mentioned in research on living spaces and challenges during the pandemic (D'Alessandro, 2020). The role of housing in the welfare state is notoriously described as awkward and uncertain especially in the period of pandemic, the relationship between housing and mental health is relevant (Blessing, 2018). Therefore, it is important to consider issues related to home space availability and crowding in order to design adequate, flexible living spaces in homes today and in the future (Ferdinando Fornara, 2021). Many article statements have come into the view of 'home' in this pandemic time. Some is positive and some is negative. Home is considered as positive when it serves as a safe and healthy place, and negative when it is a place for isolation, imprisonment or loneliness (Patrick Devine W, 2020).

The pandemic has changed people's habits, routines and lifestyles, affecting relationships and productivity across the country as people's perceptions of lifestyles, work and interactions with others have changed (Sethi M, 2020). Experience of living at home is strongly affected, especially during quarantine. Home becomes the place where most of the people conducted most or all their daily routine such as work, study, socialize and engaged in physical exercise, sharing the available space throughout

the day (Prime H, 2020). Home is not only the place for shelter from the infections but there is a possibility to change the home spatial into work place like office, classroom, gyms or even become a day care. Ministry of the presidency of the Spanish have conducted a survey by Centre for Sociological Research (CIS) and shows that most participants did activities more frequently at home during pandemic. For example, taking care of family, supervising children's homework, contacting parents by phone and connecting with relatives or friends by video call. Another survey showed different results where the most frequent activity was working remotely (Centre for Sociological Research, 2020). During the period of pandemic, a lot of studies have been conducted to investigate the impact of pandemic towards the way people lived. In (Verdugo Lopez, 2021) study, it states the importance of living condition during pandemic in Culiacan, Mexico. The investigation was to understand how social distancing had affected the way people lived. The permanence of its inhabitants within it homes is determined by the design of the space. Space design issue such as number of window, the room size of the occupants and the distribution of space in the same house will affect their capacity to work or study during the lockdown (Bambra C, 2020) (Lidia Morawska, 2020) . In addition, a mixed approach research on Spanish resilience also shows the result of 50% of participants needed a home spatial organization and almost 50% would like to have an outdoor area if possible (Cuerdo-Vilches, Navas-Martín, & Oteiza, 2020).

At the same time, when people spend most of their time at home, the energy consumption in residential building will be increased as well. This is based on a study in New York city, domestic household energy consumption increased to about 23% in March 2020. On the other hand, industrial and commercial building energy consumption decreased around 7%. This clearly indicates the high residential electricity consumption will lead to an increase economic and financial burden to families (Christoph, et al., 2020). In this extreme case, the importance of building energy saving renovation is also highlighted (Monzón-Chavarrías, 2021), after renovation of old building it will have more energy efficient. With the context, fear of economic recession and have to stay home, the life style due to pandemic has increased in the demand of moving house, shifted to be more inclined towards control houses.

People need to reduce expenses due to fear of economic recession,

while applying designs that can accommodate a stay home lifestyle (Amerio, 2020). This can be through reassessing the existing spaces or total removal to another living situation. In terms of concerning disease spread where influencing by environmental factors, some studies show that ventilation and occupancy rates can play an importance role in reducing the disease spread (Paraskevis D, 2021). Environment factor such as overcrowding, poor maintenance, discontinuous energy and water supply and unhealthy environment among the other elements led to higher transmission of disease. Based on the research in Malaysia, many Malaysians have become compulsive online buyers and the food waste issue. Household waste separation planning becomes an intention study toward a healthy living (Mohd Noor, 2021). As a result, pandemic has highlighted the most unsafe residential environment condition (Team V, 2020) (Rosenberg A, 2020 Jul). In Australia, it revealed that residents in social housing often face a lack of social integration by locking down the entire residential block due to the outbreak of infection (Power, 2020). On the subject of this issue, individual that is infected must go into home quarantine where the WHO recommends to having a separate room with a good ventilation and separate bathroom (World Health Organization, 2021). The risk of pandemic is increasing rapidly due to contact with wildlife, livestock and human, and is becoming more and more common due to a constant increase in underlying emerging diseases caused by animal microbes. It will be going to have more than 5 new diseases in a year and any of them is at the risk for spreading and becoming to new pandemic (Daszak, et al., 2020). Therefore, it is a crucial for people to prepare a sustainable health emergency to face the next pandemic (World Health Organization, 2020).

FINDING

Lessons Learn from the Covid-19 Pandemic

The Covid-19 experience has revealed certain deficiencies in current residential building especially in indoor spatial design. The concept of literature review in this study is based on the topics and consequence of discussion as presented in Table 1. The impact of pandemic has made people's behaviour and lifestyle change, at the same time quarantine and

isolation at home during pandemic had influence people’s physical and mental health. At the end of this crisis, people need to understand and find a way that future isn’t something negative coming to us; people need to reverse understanding to accept a fundamental change (Holl, 2020).

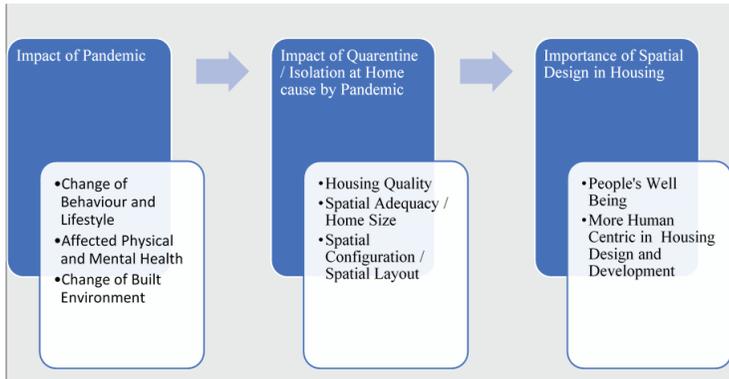


Figure 1. Overall Conceptual

Source: Author

People’s behaviour occupying indoor spaces is essential for their proper functioning and performance during their life time. In some sense, people get involved in aspects such as the efficient use of resources, including energy and indoor environment quality. It is very important to know people’s need in using their space pattern as well as their space perception. At the same time, it is a key in knowing whether the living space is satisfactory for the performance of their tasks, well-being and health during the pandemic.

Table 1 shows the literature review based on type and topic discussion to support the specific parameters.

Table 1. Summary of Literature Review

	Housing Quality	Spatial Adequacy / Home Size	Spatial Configuration
Theoretical	Important of indoor ventilation (Lidia Morawska, 2020)	Need of larger home size (Amerio, 2020) Need of outdoor space (Cuerdo-Vilches, Navas-Martín, & Oteiza, 2020)	Need of spatial organization (Cuerdo-Vilches, Navas-Martín, & Oteiza, 2020)

Empirical	Need of good indoor quality (López, 2021)	Need of outdoor space (Mahsa Zarrabi, 2021)	Need of green feature (Giuseppina Spano, 2021)
Policy	Need of good indoor air quality (López, 2021) Need of good quality and security of housing (Team V, 2020)	Need of larger home size (Sethi M, 2020)	Need of green view (D'Alessandro, 2020)

Source: Author

It is humanity’s responsibility to prepare plan and implement necessary action for future extreme outbreaks. From the summary of literature review, post-pandemic housing is also expected to experience major transformation toward sustainability. Residential houses should provide certain comfort, health and safety protective measure for their occupants especially on spatial design.

CONCLUSION

The discussion provides some first evidence that the pandemic and the need for people into lockdown requires a reflection on the home spatial design to adjust to a specific function for which they are not designed to, to ensure health and wellbeing of people during the pandemic and even post pandemic. As the WHO pointed out, Covid-19 is not the last health emergency the world will suffer, so there is an urgent need for sustainable preparedness for health emergencies to face the next pandemic (World Health Organization, 2020). For this sustainable preparation, it is important to increase home resilience. Home quarantine or home isolation made housing the protective element against the pandemic. As a result, it will have an effect globally, so new architectural design paradigms need to be rethought. Some traditional functions had to be segregated to make room for new ones (Jaimes Torres M, 2021). With all of the above, a knowledge gap is detected within the literature such as it presented a full picture of people’s home perception that involve material, distribution of space, habitability and comfort as well as the health issue when staying at home. But, it is necessary to portray how housing has responded to this dynamic situation and it is crucial to reconsider design and operation in residential building

with a new perspective so to provide a better resilience, which is seen as a sustained capacity of a community to resist and recover from adversity (Chandra, 2011). Finally, all the article reviews information obtained will be further useful for regional regulations for the authorities to updating country development plan and to the sustainable development of the country's housing and infrastructure in the future. As people try to understand the role of architecture post- pandemic, people have to first better understand the way people inhabit building and move through space (Kennicott, 2020). This is the reason why different authors point out different importance of new spatial conditions and the design surrounding areas include architectural design and urban design in general.

ACKNOWLEDGEMENT

I would like to express my deepest gratitude to University Technology Malaysia, Faculty of Built Environment and Surveying who gave me the opportunity and support in this research. This publication is a part of the first author's Master of philosophy study requirements.

FUNDING

There is no funding for this research.

AUTHOR CONTRIBUTIONS

All authors contributed to the design of the research, the questionnaire, and the write-up. The on-line survey, data cleaning and tabulation was undertaken by researcher. All authors have read and approved the final manuscript.

REFERENCES

- Adams, R. I. (2016). Ten questions concerning the microbiomes of buildings. *Building and Environment*, 109, 224-234.
- Amerio, A. A. (2020). COVID-19 Lockdown: Housing Built Environment's

Effects on Mental Health. *International Journal of Environmental Research and Public Health* 17(10)16, 5973.

Amir, A. F. (2022). Students' perception and preference towards open and distance learning (ODL) during covid-19 pandemic: A case study of studio-based learning. *Malaysian Journal of Sustainable Environment (MySE)*, 9(1), 285-302.

Baldwin, A. (2006). *Sars and the built environment in Hong Kong*. The Institution of Civil Engineers-municipal Engineer (pp. 37-42). PROC INST CIVIL ENG MUNIC ENG.

Bambra C, R. R. (2020). *The COVID-19 pandemic and health inequalities*. *Epidemiol Community Health* 2020, 74: 964-968.

Blessing, A. (2018). Theorizing Housing for Research, Policy and Practice. *Housing Theory and Society*, 35, 211–219.

Brodeur, A. C. (2021). COVID-19, lockdowns and well-being : Evidence from Google Trends. *Journal of public economics*, 193, 104346.

Brooks, S. K. (2020). *The psychological impact of quarantine and how to reduce it: rapid review of the evidence*. *The lancet*, 395(10227), 912-920.

Caratozzolo, S. Z. (2020). *The impact of COVID-19 on health status of home-dwelling elderly patients with dementia in East Lombardy, Italy: results from COVIDEM network*. *Aging Clin. Exp. Res.*, 32, 2133-2140.

Centre for Sociological Research. (2020). *Emotion Well- Being*. Retrieved from https://www.cis.es/cis/export/sites/default/-Archivos/Marginales/3280_3299/3285/es3285mar.pdf

Chandra, A. &-P. (2011). *Building Community Resilience to Disasters: A Way Forward to Enhance National Health Security*.

Cherry JD, K. P. (2004). *SARS: the first pandemic of the 21st century*. *Pediatr Res*, July.

Christoph, Meinrenken, Modi, V., R, K., Mckeown, & J, P. (2020, April 21). *New Data Suggest COVID-19 Is Shifting the Burden of Energy Costs to Households*. Retrieved from Columbia Climate School: <https://news>.

- climate.columbia.edu/2020/04/21/covid-19-energy-costs-households/
- Cieraad, I. (2019). "Home" in *The International Encyclopedia of Anthropology*. In I. Cieraad, *The International Encyclopedia of Anthropology* (pp. 1-8). John Wiley & Sons, Ltd.
- Covid Now Malaysia. (2022). *The official Malaysia government website for data and insights on COVID-19*. Retrieved from COVIDNOW: <https://covidnow.moh.gov.my/>
- Cuerdo-Vilches, T., Navas-Martín, M., & Oteiza, I. (2020). A Mixed Approach on Resilience of Spanish Dwellings and Households during Covid-19 Lockdown. *Sustainability* 2020.
- D'Alessandro, D. G. (2020). COVID-19 and Living space challenge. Well-being and Public Health recommendations for a healthy, safe, and sustainable housing. *Acta bio-medica : Atenei Parmensis*, 91(9-S), 61–75.
- Daszak, J, A., Neves, D., D, H., T, K., B, R., . . . Y, F. (2020). *IPBES Workshop on Biodiversity and Pandemics Report_0*. Retrieved from ipbes.net: https://ipbes.net/sites/default/files/2020-12/IPBES%20Workshop%20on%20Biodiversity%20and%20Pandemics%20Report_0.pdf
- Dursun, P. G. (2003). *Spatial analysis of different home environment in the city of Trabzon, Turkey*. Fourth International Space Syntax Symposium, (pp. 17-19). London.
- Ferdinando Fornara, O. M. (2021). Space at home and psychological distress during the Covid-19 lockdown in Italy. *Journal of environmental psychology*, 79.
- Giacobbe, A. (2020, March 18). *How the COVID-19 Pandemic Will Change the Built Environment*. Retrieved from ARCHITECTURE + DESIGN: <https://www.architecturaldigest.com/story/covid-19-design>
- Giuseppina Spano, M. D. (2021). Association between indoor-outdoor green features and psychological health during the COVID-19 lockdown in Italy: A cross-sectional nationwide study. *Urban Forestry & Urban Greening Volume* 62, 127156.

- Grant, M. J. (2009). A typology of reviews: an analysis of 14 review types and associated methodologies. *Health information & libraries journal*, 26(2), 91-108.
- Holl, S. (2020, May 25). *How Covid 19 can transform the building where we live and work*. (T. W. Post, Interviewer)
- IP Mark. (2016, May 24). *A day in the life of the Spaniards*. Retrieved from IP Mark: <https://ipmark.com/habitos-vida-espanoles/#:~:text=Seg%C3%BAAn%20el%20estudio%2C%20pasamos%20la,lugar%20lo%20ocupa%20el%20trabajo>
- Jaimes Torres M, A. P.-V.-M. (2021). Habitability, Resilience, and Satisfaction in Mexican Homes to COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*. 2021, 18(13):6993.
- Jamal H, M. A. (2021, May 7). *Covid-19 Epidemic in Malaysia: Epidemic Progression, Challenges, and Response*. Pathophysiology, Epidemiology, Clinical Management and Public Health Response.
- Jobstreet by seek. (n.d.). *67% of Malaysian Companies Required Staff to Work from Home*. Retrieved from Jobstreet by seek: <https://www.jobstreet.com.my/en/cms/employer/laws-of-attraction/inspirations/67-of-malaysian-companies-required-staff-to-work-from-home/>
- Kementerian Kesihatan Malaysia. (2022). *Pemantauan Kendiri Kes Positif COVID-19 di Rumah*. Retrieved from Kementerian Kesihatan Malaysia: <https://covid-19.moh.gov.my/garis-panduan/pemantauan-kendiri-kes-positif-covid-19-di-rumah>
- Kennicott, P. (2020, July 13). *The Washington Post Magazine*. Retrieved from *Designing to Survive*: <https://www.washingtonpost.com/magazine/2020/07/13/pandemic-has-shown-us-what-future-architecture-could-be/>
- KLEPEIS, N. N. (2001). The National Human Activity Pattern Survey (NHAPS) - a resource for assessing exposure to environmental pollutants. *J Expo Sci Environ Epidemiol* 11, 231–252.

- Kloncz, S. (2020, April 7). *How Pandemics Have Shaped Design and What We Can Expect Post-COVID19*. Retrieved from Dura Supreme Cabinetry: <https://www.durasupreme.com/blog/how-pandemics-have-shaped-design-and-what-we-can-expect-post-covid19/>
- Lidia Morawska, J. W. (2020). How can airborne transmission of COVID-19 indoors be minimised? *Environment International*, volume 142.
- Lim, I. (2020, April 17). *Covid-19: Eight states, two FT record zero or minimal new cases; Kota Tinggi is new orange zone*.
- López, M. Z. (2021, June 28). *Coronavirus: How infected air can* . Retrieved from EL PAÍS: <https://elpais.com/especiales/coronavirus-covid-19/how-infected-air-can-flow-from-one-apartment-to-another/>
- López-Bueno, R. L.-S. (2021). Potential health-related behaviors for pre-school and school-aged children during COVID-19 lockdown: A narrative review. *Preventive Medicine*, 143, 1063.
- LS, H. (2003). The SARS epidemic in Hong Kong: what lessons have we learned? *J R Soc Med*, 96(8):374-8.
- Maestro-Gonzalez, A. S.-Z.-D.-R. (2021). Quality of sleep among social media users during the lockdown period due to COVID-19 in Spain. *Sleep Medicine*, 80, 210-215.
- Mahsa Zarrabi, S.-A. Y.-B. (2021). COVID-19 and healthy home preferences: The case of apartment residents in Tehran. *Journal of Building Engineering*, 35, 102021.
- Maryam AlKhateeb, H. P. (2021). *The impact of COVID-19 on perceptions of home and house design in Saudi Arabia*. Reflections on the design responses to the need to reimagine spaces and places,14.
- Mohd Noor, N. H. (2021). Understanding Malaysian household waste separation: An extended theory of planned behavior. *Malaysian Journal of Sustainable Environment (MySE)*, 9(1), 19-35.
- Monzón-Chavarrías, M. S.-L.-P.-G.-P. (2021). *Heating Energy Consumption and Environmental Implications Due to the Change in Daily Habits in Residential Buildings Derived from COVID-19 Crisis: The Case of*

Barcelona, Spain. Sustainability 2021.

Naglaa A. Megahed, E. M. (2020). Antivirus-built environment: Lessons learned from Covid-19 pandemic. *Sustainable Cities and Society*, volume 61.

Noor Hazliezah Tamin, M. M. (2020). Google Classroom for Teaching and Learning in Malaysia Primary School during MCO due to pandemic. *International Journal of Multidisciplinary Research and Publications*, 34-37.

Paraskevis D, K. E. (2021). *A review of the impact of weather and climate variables to COVID-19: In the absence of public health measures high temperatures cannot probably mitigate outbreaks*. *Sci Total Environ*.

Patrick Devine W, L. P. (2020). Replaced - Reconsidering relationships with place and lesson from a pandemic. *Journal of Environmental Psychology*, 72.

Power, E. &. (2020). Public housing and COVID-19: contestation, challenge and change. *International Journal of Housing Policy*, 20. 313-319.

Prime H, W. M. (2020). *Risk and resilience in family well-being during the covid-19 pandemic*.

Rosenberg A, K. D. (2020 Jul). COVID-19 and Hidden Housing Vulnerabilities: Implications for Health Equity, New Haven, Connecticut. *AIDS Behav*, 24(7):2007-2008.

Roux, H. I. (2020, March 31). *Architecture: four ideas from history that offer healthier design*. Retrieved from The Conversation, Academic rigour, journalistic flair: <https://theconversation.com/architecture-four-ideas-from-history-that-offer-healthier-design-134261>

Sethi M, M. S. (2020). *Improvised rental housing to make cities Covid safe in India*.

Team V, M. L. (2020). How COVID-19 Reveals Structures of Vulnerability. *Med Anthropol*, 39(8):671-674.

The Straits Time. (n.d.). *Malaysia orders Covid-19 patients with mild or*

no symptoms to be treated at home. Retrieved from The Straits Time: <https://www.straitstimes.com/asia/se-asia/malaysia-orders-covid-19-patients-with-mild-or-no-symptoms-to-be-treated-at-home>

Verdugo Lopez, M. (2021). Housing Habitability in Times of Covid-19 in Mexico. *Ehquidad Revista Internacional de Políticas de Bienestar y Trabajo Social*, 15, 17-112.

World Health Organization. (2020, October 1). *The best time to prevent the next pandemic is now: countries join voices for better emergency preparedness*. Retrieved from who.int: <https://www.who.int/news/item/01-10-2020-the-best-time-to-prevent-the-next-pandemic-is-now-countries-join-voices-for-better-emergency-preparedness>

World Health Organization. (2021). *Guilines for Home Quarantine*. Retrieved from World Health Organization: <https://www.who.int/docs/default-source/searo/whe/coronavirus19/the-guideline-for-home-quarantine--quarantine-in-non-health-care-settings-is-intended-for-anyone-who-believes-they-have-been-exposed-to-covid-19-and-are-required-to-be-home-quarantined-to-pr>

World Health Organization. (2022). *WHO Coronavirus (COVID-19) Dashboard*. Retrieved from World Health Organization: <https://covid19.who.int/>

Wu, J. &. (2020). Association of COVID-19 Disease Severity with Transmission Routes and Suggested Changes to Community Guidelines. *SSRN Electronic Journal*, 10, 2139.

Yuko, E. (2020, March 13). *How Previous Epidemics Impacted Home Design*. Retrieved from Architectural digest: <https://www.architecturaldigest.com/story/subway-tile-design-in-epidemics>

Surat kami : 700-KPK (PRP.UP.1/20/1)

Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
Rektor
Universiti Teknologi MARA
Cawangan Perak



Tuan,

PERMOHONAN KELULUSAN MEMUAT NAIK PENERBITAN UiTM CAWANGAN PERAK MELALUI REPOSITORI INSTITUSI UiTM (IR)

Perkara di atas adalah dirujuk.

2. Adalah dimaklumkan bahawa pihak kami ingin memohon kelulusan tuan untuk mengimbas (*digitize*) dan memuat naik semua jenis penerbitan di bawah UiTM Cawangan Perak melalui Repositori Institusi UiTM, PTAR.

3. Tujuan permohonan ini adalah bagi membolehkan akses yang lebih meluas oleh pengguna perpustakaan terhadap semua maklumat yang terkandung di dalam penerbitan melalui laman Web PTAR UiTM Cawangan Perak.

Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

“BERKHIDMAT UNTUK NEGARA”

Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
Timbalan Ketua Pustakawan

nar

Setuju.

27.1.2023

PROF. MADYA DR. NUR HISHAM IBRAHIM
REKTOR
UNIVERSITI TEKNOLOGI MARA
CAWANGAN PERAK
KAMPUS SERI ISKANDAR