The Geography of Accessibility: Assessing the Malaysian Approach to COVID-19 Pandemic Management

Kebolehcapaian Geografi: Menilai Pendekatan Malaysia Dalam Pengurusan Pandemik COVID-19

FAUZIAH CHE LEH
Department of Geography and Environment
Faculty of Human Sciences
Universiti Pendidikan Sultan Idris
35900, Tanjong Malim, Perak.

Corresponding author: fauziah@fsk.upsi.edu.my

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ABSTRACT *Several diseases, such as severe acute respiratory syndrome (SARS), influenza and Ebola, are epidemic-prone diseases that have threatened public health in the past. The coronavirus 2019 disease (COVID-19) outbreak, which started in Wuhan, China, in December 2019 and spread from there, was officially declared a public health emergency by the World Health Organization on January 30, 2020. Subsequently, COVID-19 was deemed a worldwide pandemic, as it had infected a large geographical area with a very high population density. As of 2 November 2020, more than 46,639,757 COVID-19 cases, and a total of 1,202,013 deaths, have been reported globally, and the number continues to grow. Therefore, an effective approach to public health policy is needed in most developing countries, including Malaysia, to facilitate preparation for and management of disease outbreaks in terms of health facilities, contact tracing and geographical access, at all levels of local and state governments. This article discusses an assessment of the Malaysian approach to the management of the COVID-19 pandemic, using secondary data obtained from the Malaysian Ministry of Health and online publications. The discussion shows that the introduction of technology to increase geographic accessibility will help in the management of the pandemic for all involved parties. Accessibility is an important indicator of disease control to a healthcare provider because it combines several factors, such as population, resources to access, source location and the distance between peoples' residences and available resources.*

Keywords: diseases, public health, epidemic management, COVID-19, geographic accessibility

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ABSTRAK *Beberapa penyakit, seperti sindrom pernafasan akut yang teruk (SARS), influenza dan Ebola, adalah penyakit rawan wabak yang telah mengancam kesihatan awam pada masa lalu. Wabak penyakit coronavirus 2019 (COVID-19), yang bermula di Wuhan, China, pada bulan Disember 2019 dan tersebar dari sana, secara rasmi diisytiharkan sebagai kecemasan kesihatan awam oleh Pertubuhan Kesihatan Sedunia pada 30 Januari 2020. Selepas itu, COVID-19 dianggap sebagai wabak di seluruh dunia, kerana ia telah menjangkiti kawasan geografi yang besar dengan kepadatan penduduk yang sangat tinggi. Sehingga 2 November 2020, lebih daripada 46.639.757 kes COVID-19, dan sejumlah 1.202.013 kematian, telah dilaporkan di seluruh dunia, dan jumlahnya terus bertambah. Oleh itu, pendekatan yang berkesan terhadap dasar kesihatan awam diperlukan di kebanyakan negara membangun, termasuk Malaysia, untuk mempermudahkan persiapan dan pengelolaan wabak penyakit dari segi kemudahan kesihatan, penelusuran kontak dan akses geografi, di semua tingkat pemerintah daerah dan negeri. Artikel ini membincangkan penilaian pendekatan Malaysia terhadap pengurusan pandemik COVID-19, menggunakan data sekunder yang diperoleh dari Kementerian Kesihatan Malaysia dan penerbitan dalam talian. Perbincangan menunjukkan bahawa pengenalan teknologi untuk meningkatkan kebolehcapaian geografi akan membantu dalam pengurusan wabak bagi semua pihak yang terlibat. Kebolehcapaian merupakan petunjuk penting bagi pengendalian penyakit kepada penyediaan perkhidmatan kesihatan kerana ia menggabungkan beberapa faktor, seperti penduduk, sumber daya untuk mengakses, lokasi sumber dan jarak antara tempat tinggal manusia dan sumber yang ada.*

Kata kunci: penyakit, kesihatan awam, pengurusan wabak, COVID-19, kebolehcapaian geografi

1. Introduction

In achieving its vision for 2020, Malaysia is set to become a united nation, with a confident, strong moral and ethical society, living in democratic, liberal, loving and tolerant communities, fair in terms of economic distribution, progressive and prosperous, with full mastery of a competitive, dynamic, vibrant and resilient economy. However, the year 2020 began with an outbreak of a deadly infectious new coronavirus strain, SARS-CoV-2, or coronavirus 2019 (COVID-19). According to Du et al. (2020), a sudden spread of the virus occurred outside Hubei province in China, as travel increased before the Chinese New Year on 25 January 2020. The World Health Organization (WHO) officially declared COVID-19 a public health emergency of international concern on 30 January 2020. Although several infectious diseases, such as severe acute respiratory syndrome (SARS), influenza and Ebola, are epidemic-prone diseases that have threatened public health in the past, the new virus is more terrifying. Without a vaccine, COVID-19 has become a global pandemic, as it has infected a large geographical area with a very high population density within a short period of time. As

of 2 November 2020, more than 46,639,757 coronavirus cases, and 1,202,013 deaths, have been reported across the world, and the number is still growing (CSIS, 2020). Many approaches have been introduced to assess management of the pandemic. This study aimed to identify the approach taken in Malaysia compared to those employed in other countries to address the COVID-19 health crisis. With the help of geospatial-analytical methods, the environmental interpretation of the effects and consequences of COVID-19 can provide complete and easily accessible information that includes large and web-based data mining space analysis and representations. This study summarises the research on Malaysia's epidemic management in a geographical context. It also illustrates the potential geographical approaches have for curbing the disease.

2. Literature Review

Coronaviruses can cause illnesses ranging from the common fever to more severe diseases, such as SARS, Middle East respiratory syndrome (MERS-COV), pneumonia and kidney failure, and even death (Guo et al., 2020). Older people and people with chronic illnesses like diabetes are more prone to infection and experience serious side effects, such as acute respiratory distress syndrome and cytokine storms. COVID-19 infections are transmitted from person to person through drops generated from the infected person's respiratory system, often during coughing or sneezing (Guo et al., 2020). According to Du et al. (2020), a sudden spread of the virus occurred outside Hubei province, as travel increased before the Chinese New Year on 25 January 2020 before travel restrictions were implemented in Wuhan. Du et al. (2020) indicated the time from exposure to onset of symptoms is usually between 2 and 14 days, with an average of 5 days. The infected person cannot be traced until they exhibit symptoms, such as fever, cough and shortness of breath. In the meantime, the virus can be spread through all interpersonal encounters. The situation will become worse if the infected person attends a big event or gathering. The rapid spread of the outbreak has been supported by progress in global transport, telecommunications and trade. For example, an individual flying from one end of the globe to another can introduce a new disease to the other side of the world within hours and without even showing any symptoms (WHO, 2018). Moreover, urbanisation and population increases are contributing to swelling the spread of the outbreak. The unprecedented levels of urbanisation and growth of cities have inevitably created a greater risk for spreading contagious diseases. Zhou et al. (2020) supported that the acceleration of global urbanisation, increasing population concentrations, more frequent and complex interactions and lack of medical protection in developing countries all increase the difficulty of prevention and control

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of COVID-19. Furthermore, all global activities, such as travelling, increase contact between people and animals, and trade activities promote virus outbreaks. According to the WHO (2018), potential changes in land use, agricultural practices and food production, such as poultry and livestock markets and deforestation, have also led to an increase in human-wildlife encounters, which have led to an increase in infections. COVID-19 has negatively affected some countries, especially in terms of economy and lifestyle. Indeed, the devastating impacts have affected countries and the global economy by disrupting travel, trade and livelihoods, for example. This can lead to very scary scenarios, such as billions in business losses.

3. Methodology

This article discusses an assessment of the Malaysian approach to the management of the COVID-19 pandemic, using secondary data obtained from the Malaysian Ministry of Health and online publications.

4. Findings of the Study and Discussion

Almost all countries in the world have been affected by this epidemic in terms of economic, political and social problems. Ten Southeast Asian countries, which are the members of the Association of Southeast Asian Nations (ASEAN), were among the first to be affected by this pandemic due to their strong ties in tourism and trade, as well as their close positions to each other (Djalante et al., 2020). At least 952,211 COVID-19 cases with 22,971 deaths in total were reported as of 2 November 2020 in the 10 ASEAN countries (CSIS, 2020). Table 1 shows the impacts on the ASEAN countries as of 2 November 2020. The total number of COVID-19 cases has increased drastically in some of the ASEAN countries, especially in Indonesia, Myanmar and the Philippines, since the first global outbreak in March 2020. As the health of the world's population becomes more at risk from a variety of diseases, in conjunction with the globalisation effect, health facilities need to be well-established and prepared for the worst-case scenario in realising the United Nations' third sustainable development goal (SDG) to supply and support universal health coverage, including financial risk protection, access to quality essential healthcare services and access to safe, effective, quality and affordable essential medicines and vaccines for all (United Nations Development Programme (UNDP), 2020). Disadvantaged urban area residents who lack access to quality healthcare facilities can increase the risk of the spread of disease because their infections may be undetected and untreated, as their options for detection, prevention and control are reduced. Moreover, many countries have allocated more of their

budgets to measures to address COVID-19, leading some to project a spending deficit for fiscal year 2020 (Muhammad Ashraf & Norazha, 2020).

Table 1: Impacts of COVID-19 in ASEAN Countries as of 2 November 2020 (CSIS, 2020)

Country	Cases	Cases last 24 hour	Deaths	Tests	Recovered	Cases per million
World	46,639,757	443,670	**1,202,013**	-	31,155,083	5,979
Brunei	148	0	3	69,473	143	345
Cambodia	292	1	0	10,438	283	18
Indonesia	415,402	2,618	14,044	2,919,560	345,566	1,550
Laos	24	0	0	66,366	23	3
Malaysia	33,339	834	251	2,137,657	23,120	1,069
Myanmar	54,607	1,202	1,282	621,383	37,954	1,023
Philippines	385,400	2,287	7,269	4,848,952	348,830	3,674
Singapore	58,020	1	28	3,680,000	57,924	10,339
Thailand	3,787	3	59	898,707	3,595	55
Vietnam	1,192	12	35	1,260,799	1,065	12
Total ASEAN	**952,211**	**6,958**	**22,971**	**16,513,335**	**818,503**	**18,088**

Last updated: 2 November 2020
Source: Johns Hopkins University and Southeast Asian Health Ministries

These expenditures involve the purchase of additional medical equipment from neighbouring countries and channelling financial assistance to local small and medium enterprises (SMEs) affected by the pandemic. Therefore, most developing countries like Malaysia need an effective approach to public health policy in order to prepare for and properly manage any kind of disease outbreak in terms of having adequate healthcare facilities and geographical access, at all levels of local and state government. At the same time, each party such as developed countries should strive to provide the assistance needed by small countries that are at risk of infection. Figure 1 depicts the epic curve of the confirmed mortality rate as of 23 October 2020 (CSIS, 2020). The Philippines has experienced the highest mortality rate of the ASEAN nations, followed by Indonesia and Myanmar. The rapid increase in cases began in July for the Philippines and Indonesia. Meanwhile, cases in Myanmar have drastically increased since the middle of September 2020.

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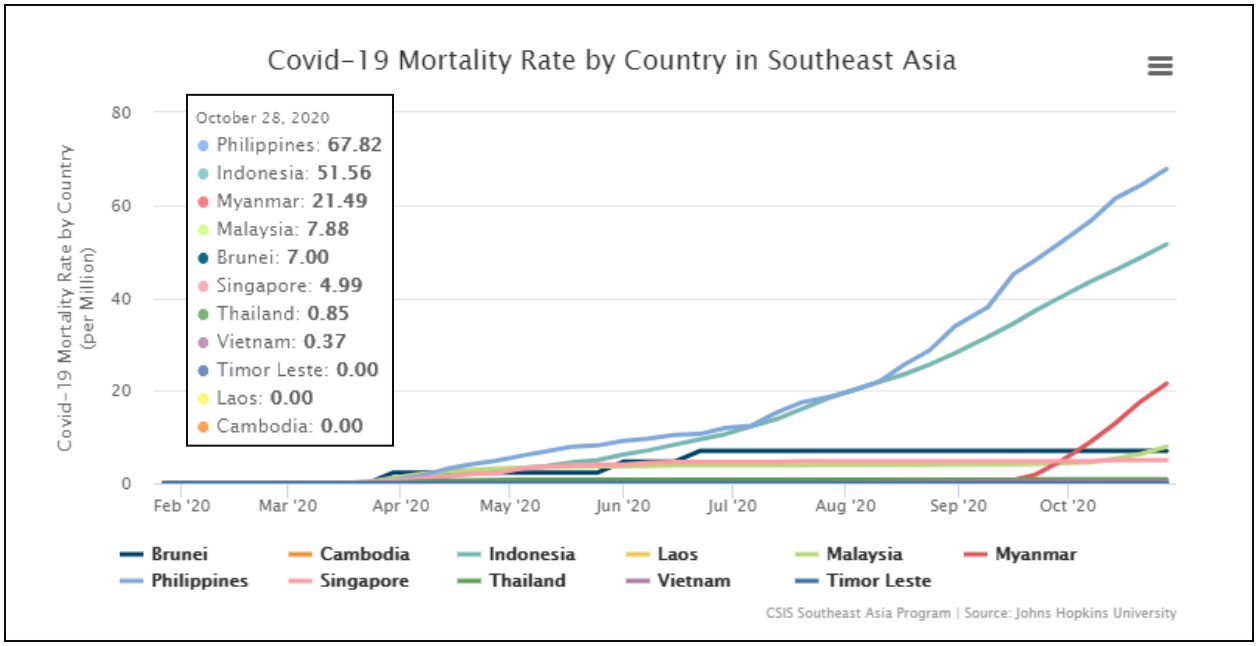

Figure 1: COVID 19 Mortality Rate by Country in Southeast Asia as of 28 October 2020
Source: CSIS, 2020.

Health issues can also lead to economic setbacks if not addressed appropriately. Thus, nationwide health challenges need to be remedied to ensure that the business sector is protected. Muhammad Ashraf & Norazha (2020) noted that economic growth will be sustained as long as the basic issues of human security are safeguarded. In addressing this issue, international cooperation, including regional cooperation, is crucial for any country to survive, but especially for low-income countries. ASEAN Vision 2025 for disaster management situations emphasises that the exchange of communication between all stakeholders involved is a complex, critical and most important task (ASEAN, 2012). Thus, Malaysia has taken on the responsibility of leading the ASEAN Emergency Operations Centre Network for public health emergencies (ASEAN EOC Network) and its initiative to share daily situation updates on the disease (Djalante et al., 2020). The ASEAN EOC Network, led by the Ministry of Health Malaysia, has provided various platforms for use by ASEAN member countries working in crisis centres, prevention and disease control to share accurate and up-to-date information with the general public. This situation proves the sophistication of this facility in helping facilitate the disaster management process, informing people what ASEAN countries are doing to assist disaster-stricken populations, increasing ASEAN involvement and visibility in the region and placing the ASEAN EOC Network as a pioneer in the region. Table 2 summarises the response by each ASEAN country's government to the pandemic.

Table 2: Summary of ASEAN Country Responses to COVID-19 January–November 2020

Country	National Response to COVID-19 Pandemic				
	Closing of border crossings	**Travel restrictions or entry prohibitions**	**Closing of non-essential businesses, schools and other public places**	**Quarantine or lockdown**	**Provision of economic stimulus**
1. Thailand, estimated population 69,766,356. [2]	Began closing borders with neighbouring countries 26 March.[2]	A complete ban on incoming flights since early April except for diplomatic missions, freight transport and foreigners with work permits.[2]	i. Mass rallies prohibited beginning on 6 April. Cancellation of Thai New Year celebration 'Songkran'.[2] ii. Movement of residents across the province limited, and leisure and public places, including restaurants, department stores, sports complexes, museums, libraries, beauty and health salons, markets and schools, closed until 30 April.[1] iii. Opened online classes until mid-May.[2] iv. After emergency extension until 31 May, the government relaxed several restrictive measures, including reopening six types of businesses from 3 May, including restaurants, markets, supermarkets or grocery stores, public parks and outdoor sports, hair salons and pet care services.[1]	i. The closure of some countries in a state of emergency from 26 March to 30 April announced.[2] ii. Phuket completely closed since 30 March.[2] iii. Emergency state extended from 2 April to 31 May by limiting activities from 10 p.m. to 4 a.m.[1]	i. First package, worth 100 billion baht (USD 3.2 billion), focused on supporting businesses in the form of low-interest loans, withholding tax deductions and Value Added Tax (VAT) refunds.[2] ii. Second stimulus worth 117 billion baht (USD 3.56 billion) on 24 March.[2] iii. Later, plans made to borrow 1 trillion baht (USD 30.6 billion) for subsequent stimulus package to address economic impact of COVID-19.[2]

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2. Vietnam, estimated population 97.3 million.[2]	i. Two weeks after the first case on 23 January, most of the border gates in northern Lang Son province were closed.[1] ii. Border sharing with Cambodia and Laos closed since 31 March. [2]	i. Admission denied to all foreigners.[6] ii. Stopped issuing visas for foreigners from infected countries.[2] iii. All international flights coming in or departing from the pandemic area delayed as soon as first case confirmed.[2] iv. Only Vietnamese citizens, foreigners in diplomatic or official business and highly skilled workers allowed to enter the country.[6] v. Vietnam considering opening borders to foreign visitors from countries that have not reported new coronavirus cases for 30 days, especially China, South Korea and Japan.[6]	i. School/university closure nationwide after Lunar New Year holiday (25 January). Cancellation of public events/closing of public places in areas that declared a COVID-19 outbreak.[7] ii. As of 27 April, 30 provinces allowed to continue classes.[7] iii. Middle schools and high schools in big cities return to class, while kindergartens and primary schools return on 11 May.[7] iv. All cultural, sports and entertainment activities in public places and religious ceremonies involving more than 20 people prohibited from 28 March to 15 April.[7] V. Non-essential businesses, such as bars, nightclubs, movie theatres and karaoke bars, closed until 4 May.[7] vi. Social outreach measures declining in other areas of the country, allowing some industries and businesses to resume operations from 16 April.[7]	i. Zoned large residential areas into exile zones to curb negative effects of COVID-19 epidemic in early February; first country after China to do so.[2] ii. All Vietnamese and international visitors returning from abroad required to be quarantined in a 14-day centralised facility, followed by a nationwide quarantine exercise on 1 April.[2] iii. Everyone who enters Vietnam must undergo 14-day medical examination and quarantine upon arrival.[6]	i. VND 180 tn (USD 7.7 billion) fiscal measure to help people, businesses and households affected by COVID-19 epidemic.[3] ii. Expenditure measures: (1) Planned cash transfers around VND 36 yr (0.6% of GDP) to vulnerable households, including the poor, recipients of social protection programs, temporarily retired workers or those on unpaid leave, unemployed workers without unemployment insurance and self-employed workers. Additional VND 61.7 yr for public investment (transfer from 2019) under consideration.[7] iii. Import tariff exemption for medical materials. VAT suspension for domestically produced medical materials; COVID-19 positive patient treatment costs borne by the Health Insurance Fund (under Vietnam Social Security) or by national budget.[7]
3. Brunei, estimated population	Closed access from sea and air 24 March.[2]	Citizens banned from travel abroad 15 March.[2]	Restrictions on public gatherings; work from home measures implemented;	i. All Bruneians who return to the country must undergo compulsory	i. The Ministry issued a directive to all employers to pay salaries during the

436,647.			mosques and other places of worship closed.[2]	isolation at quarantine facilities.[2] ii. Brunei fully implemented lockdown on 24 March.[2]	quarantine to their employees.[3] ii. Economic stimulus for micro, small and medium enterprises on 1 April for BND 250 million (USD 175 million).[3]
4. Malaysia, estimated population 31 million.	Closed borders with Singapore and other countries and imposed nationwide movement control orders starting 16 March (the first country to close its borders in the region).[1 & 2]	All visitors prohibited, and citizens prohibited from going abroad on 16 March.[1 & 2]	i. Ban on movements and mass rallies across the country, including all religious, sports, social and cultural activities.[8] ii. All places of worship and business closed except supermarkets, public markets, grocery stores and stores selling necessities; all kindergartens, government and private schools, including boarding schools, international schools, tahfiz centres, primary, secondary and pre-university educational institutions, public and private universities and vocational training centres closed.[8]	i. Malaysian government implemented movement control order (MCO) until 31 March.[2] ii. Implemented gradually and extended over two weeks from 18 to 31 March (phase 1), 1 to 14 April (phase 2) and 15 to 28 April (phase 3).[3] iii. Entered conditional movement control order (CMCO) 13 May.[4] iv. Rehabilitation movement control order (RMCO) effective 8 June.[4] v. On 28 August, RMCO extended to 31 December.[4] *Some impact areas in total lockdown or CMCO if high number of cases reported.	i. First stimulus package of RM 20 billion (USD 4.56 billion) approved to enable tourism and other industries in the country to deal with effects of coronavirus epidemic.[2] ii. Second stimulus package worth RM 250 billion (USD 58 billion) announced, of which RM 25 billion (USD 6 billion) to be provided to help families and business owners affected by the outbreak.[2] iii. Third package focused on providing support to small and medium enterprise (SME) businesses worth USD 1 billion.
5. Myanmar, estimated population	Closed border with China, excluding goods	30 March all international flights and visas (except diplomats)	All sectors of the economy that do not function directly to combat the epidemic closed	Yangon imposed closures in seven cities from 6 p.m. on 18 April.[2]	Announced initial stimulus package including 100 billion kyats (USD 70 million) to

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54,336,457.	and crew. India closed its borders with Myanmar. [2 & 5]	suspended.[2]	since 7 April. Bars closed and shopping malls open for limited time. [2]		support loans, reduce tax payment deadlines and even tax exemptions for local business.[2 & 3]
6. The Philippines, estimated population 106 million.	Borders closed. [5]	i. Foreigners prohibited from entering, excluding Filipino citizens and special officials.[2] ii. Stopped issuing visas to foreigners; Philippine Airlines cancelled all domestic flights.[2]	Worshipers asked to stay home and participate in online celebrations during Holy Week.[2]	i. Home quarantine for Luzon Island, home to the country's capital Manila from 16 March through end of April, expanding in certain areas, including the capital, until 15 May.[1 & 3] (iii) Military and police in place to enforce presidential orders and closure measures.[9]	i. Initiated economic stimulus to assist affected population, including social protection worth USD 3.9 billion.[2] ii. Family care plans aimed at providing psychological support to citizens to reduce COVID-19 by providing facilities for isolation if family members diagnosed with COVID-19, including identifying seniors over the age of 60 who are at risk of being infected.[3]
7. Indonesia, estimated population 272 million.	Land border with Timor-Leste and in Papua province closed.[2]	i. Travel ban for foreign visitors to Indonesia including transit since 2 April.[1 & 2] ii. Tightening previous travel restrictions to China and most affected countries.[1] iii. Exemptions apply to foreigners, including those with residence permits and diplomats.[1]	i. Large-scale social restrictions implemented for land and sea routes between the state and the sea were postponed to prevent the movement of people as Ramadan approached.[2] ii. 'Large-scale social sanctions' imposed, non-essential schools and workplaces closed and religious gatherings and non-essential activities in public restricted.[1] iii. In Jakarta, emergency alert	i. Large-scale social sanctions (or 'PSBB' in Indonesian) to expedite elimination of COVID-19 on 30 March.[2] ii. Ban on domestic travel issued 24 April for period of Ramadan. iii. Travel between cities by air, land and water postponed 3 June.[2]	Stimulus package of 405 trillion rupiah (USD 26.5 billion) announced by government, regulations in place of law (Perppu) No. 1/2020 to legitimise national expenditure and allow much greater financial release.[2]

			issued on 23 March, stopping public entertainment, restricting public transport and mandating telecommunications work where possible.[1]		
8.Singapore, estimated population 5,859,200.	Closed international borders to curb surge in import cases on 24 March.[2, 5 &11]	31 January banned all Chinese visitors; extended to all short-term visitors 22 March.[2]	i. Strict regulations on the movement of people, including a ban on entering or exiting a residence, a ban on social gatherings and maintaining a safe distance from others.[10] ii. All premises except those providing essential services closed.[10] iii. Schools and institutes of higher learning shifted to full home learning on 8 April. All preschool and student care centres closed, but limited services provided for children of parents who must continue to work and are unable to make alternative care arrangements.[11]	i. Extensive testing, contact search and quarantine of infected cases. Nationwide circuit-breaker measures announced to uphold social distance from 7 April to 4 May, later extended to June.[2] ii. Government intensified testing at 43 hostels that house 200,000 South Asian and Southeast Asian migrants working mainly in the construction sector.[2] iii. COVID-19 (Temporary Action – Operating Order) Rule 2020 ("COVID-19 Rule") immediately commenced 7 April and continued until 4 May.[10]	i. Short-term corporate tax rebates, including several fiscal injections for business and Goods and Services Tax (GST) as well as measures to reduce GST and the economic impact of COVID-19.[3] ii. Third stimulus package in two months amounted to SGD 5.1 billion (USD 3.55 billion), combined with steps worth SGD 6.4 billion (USD 4.4 billion) announced in February and SGD 48.4 billion (USD 33.7 billion) released on 26 March.[3] iii. Fiscal measure worth SGD 59.9 billion (USD 42 billion), equivalent to 12% of GDP, aimed to outperform businesses in particular and Singaporeans in general through partial monthly lockdown to reduce the increase in COVID-19 cases.[3]
9. Laos, estimated	On 30 March: closed borders	All event document holders inside and	Schools, bars, entertainment venues and major shopping	i. Homestay order including closing of	Initial 13-part stimulus package approved 20 March during

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population 7,275,560.	with Myanmar and China; Thailand and Vietnam closed their borders with Laos.[2]	outside Laos prohibited, along with suspension of all types of visas.[2]	malls ordered to close on 19 March.[2] Gatherings of more than 10 people prohibited.[2] Private hospitals and clinics closed nationwide.[2]	territorial border issued 30 March.[2] ii. Citizens returning from other countries required to self-quarantine for 14 days.[2]	monthly cabinet meeting. LAK 10 billion (USD 1.1 million).[2]
10. Cambodia, estimated population 16,718,965.	Borders closed by neighbouring countries.[2 & 5]	i. 17 March ban on tourists coming from several high-risk countries.[2] ii. Temporarily suspended all types of visas beginning 30 March.[2] iii. Travel within the country including district and provincial borders prohibited starting 10 April.[2]	Casinos and schools closed 1 April.[2]	Quarantine imposed on all visitors entering Cambodia on 8 April.[2]	Fiscal resources for health sector and businesses "legally registered and formally certified" only, which excluded 95% of businesses.

Sources: (1) OECD, 2020; (2) Djalante et al., 2020; (3) Muhammad Ashraf & Norazha, 2020; (4) MDBC, 2020; (5) KAYAK, 2020; (6) Tiket2, 2020; (7) IMF, 2020; (8) The Star, 2020; (9) CSIS, 2020; (10) Seah & Van Emmerik, 2020; (11) TODAY Singapore, 2020.

Vietnam is one of the countries that has successfully curbed the spread of the virus in its territory, despite neighbouring China and having a large population. This is the result of early and effective action by Vietnamese authorities in implementing a strict quarantine and search regime for potentially infected patients. Moreover, fast and strong action by the Vietnamese government and legislators ensured an extensive and accurate report was provided to the media so that the public received comprehensive and real information about COVID-19 and the precautions that they needed to take (OECD, 2020). The WHO has recognised and praised the Vietnam government's quick response to the emergency outbreak, which is very important in overcoming the crisis at an early stage. Brunei's successful handling of the virus should be emulated by other countries as well. The country took early action and implemented precautions, using and mobilising all funds and resources to mitigate the effects of the epidemic. According to Djalante et al. (2020), the Brunei government has been conducting a massive novel coronavirus test since January 2020 after the WHO published its first 'Disease Outbreak News' on the new virus. Singapore managed to curb the spread of the COVID-19 epidemic by acting aggressively and implementing measures similar to those implemented by Vietnam. Although Singapore recorded an increase in infections, with more than 58,000 cases, the country has been able to control the disease because of its efficient facilities and because it is a relatively small country, so its operational plan can control the COVID-19 pandemic (Muhammad Ashraf & Norazha, 2020). Singapore has used technology to verify home quarantines and trace contacts, such as text-based and mobile software and new serological tests that can establish relationships between infected patients (OECD, 2020). The use of technology in pandemic management allows authorities to quickly and efficiently map contagion chains. Based on its experience dealing with the 2003 SARS outbreak, Singapore employed existing preventive measures, including ready-made government quarantine facilities and state-of-the-art national centres for managing infectious diseases (OECD, 2020).

Unfortunately, other countries with larger populations may not be able to apply the same responses because Singapore is a small and wealthy country with more healthcare capabilities. Myanmar, the Philippines and Indonesia are among the countries with the largest populations and have recorded the highest number of contagious COVID-19 cases of the ASEAN countries. Indonesia and the Philippines are experiencing sharp increases, as both countries have large populations and lack adequate healthcare facilities to meet the needs of all their people (Muhammad Ashraf & Norazha, 2020). As part of a vulnerable country, Myanmar's public health system cannot cope with the COVID-19 pandemic scale. Djalante et al. (2020) observed that the lack of a security network in Myanmar has placed the poor among the most vulnerable

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during the pandemic health and economic crisis. As such, other developed countries need to work together to help countries affected in this manner. For instance, the United Nations has planned to donate 50,000 test kits to Myanmar, in addition to 3,000 donated by Singapore and 5,000 donated by South Korea (Djalante et al., 2020). Various lessons can be learned from the country itself and from its neighbours on government response in dealing with the COVID-19 pandemic. These lessons indicate that some changes need to be made in terms of approaches to enhance the national response to fight infection and prepare for similar virus outbreaks in the future. Among the important improvements needed are an increase in healthcare capacity, prevention and control of the infection and ensuring updated information is available for the regional community. Also, the digital sphere should be upgraded to expand and update daily information so the entire population can obtain the latest information on COVID-19 transmission news nationwide. Pardo et al. (2020) concluded that, in order to fight COVID-19, it is important to face challenges from an interdisciplinary perspective, with proactive planning, international unity and a global perspective. Hence, to increase the effectiveness of pandemic management, assistance from various parties is needed, including allocations from national budgets and support from international organisations and nearby countries, all of which is necessary to curb the spread of epidemics on a large scale.

Focusing on health and geography should provide a positive result in pandemic management. The health sector is important to ensuring the well-being and development of a country and its people. The sector is highlighted in the United Nations 2030 Agenda as the third SDG, which is to achieve good health and well-being that addresses increased economic and social inequality, rapid urbanisation, climate and environmental threats, the continuing burden of HIV and other infectious diseases and emerging challenges, such as non-communicable diseases (UNDP, 2020). Therefore, the health sector needs to be managed and developed more competitively and advance in terms of technology, while preparing to deal with all health issues for the benefit of all citizens regardless of socioeconomic status. According to Pardo et al. (2020), focus is needed on the health and geography of the population and the demographic aspect to address special issues in diseases, treatment and medicine. Since COVID-19 is a global crisis, a method that can explain the current situation should be applied for the convenience and use of the public. The strategy must interpret and analyse the situation's spatiotemporal dimensions and its geographical impact on decision-making and everyday life, and also model disease evolution predictions. Therefore, geospatial and statistical tools are highly relevant for understanding locations and the distribution patterns of COVID-19. Accessibility can be seen as a combination of several factors,

depending on the population, resources to access, source location and the distance between people's residences and resources. According to Luis & Cabral (2016), four characteristics are involved in determining the ability of the population to access healthcare services: (1) geographical accessibility, which includes physical distance or travel time for potential users; (2) availability, which refers to the adequacy of the supply of the treatment to serve all those who need it; (3) financial accessibility, or the willingness and ability of consumers to pay for services; and (4) acceptance, which is the response of health service providers to the social and cultural expectations of individuals and society in general. The results of geographic accessibility can depend on many other factors that can worsen its effects, including poor physical condition, lack of infrastructure, road network laws and lack of transportation. Thus, geographic accessibility is important to assessing the contiguous area in ensuring the population can obtain adequate assistance when hit by a pandemic, according to the four characteristics for determining access. Based on Dummer (2008) and Tunstall et al. (2004), geography, epidemiology and public health significantly affect health outcomes. Where we are born, live, study and work directly affects our health experience. Fortunately, those who live in an area with complete healthcare facilities have many advantages and access to expertise for treating the outbreak. Dummer (2008) added that finding healthcare facilities, targeting public health strategies or monitoring disease outbreaks all have a geographical context. Following the rise of the various infectious diseases, interest in the provision of health services infrastructure space has gained momentum in recent years. Thus, healthcare facilities need to advance to align with challenging situations. Rocha et al. (2017) noted that spatial analysis and geographic information systems have proven useful in studying healthcare provision and service planning. Among the technology that can help to access geography information is the geographic information system (GIS), remote sensing, global positioning system (GPS) and online mapping, such as Google Earth (Forbes MAIL, 2020). These tools have proven to be useful aids for managing prior infectious disease outbreaks. The WHO, public institutions in various countries, Johns Hopkins University and big platforms like Google, Baidu or Facebook make their information available to the public to make it possible to coordinate responses to epidemics (Pardo et al., 2020). Other developed countries have practised these technologies and have gained many benefits from having access to information on all the world's problems, including the spread of the COVID-19 epidemic. The COVID-19 pandemic is somewhat of a mystery, because many aspects of the disease are unknown, including the dimensions of space that can lead to understanding phenomena as geographically and potentially mapped. Based on Pardo et al. (2020), health science research requirements include the ability to cross variables of

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various types to interpret the COVID-19 phenomenon, its spatial analysis and its spatiotemporal dimensions, its geographical impact on decision-making and everyday life and modelling disease evolution predictions. Hence, the use of geospatial and statistical tools, which are also available through GIS applications, has become highly relevant to the declaration of COVID-19 as a global pandemic.

GIS applications have grown rapidly and matured, following a comprehensive technology path for data preparation, platform construction, model building and mapping. In the fight against COVID-19, GIS and big data technologies have played a key role in many aspects, including rapid multi-source data collection, rapid epidemic information visualisation, case-proven space tracking, regional deployment forecasts, segmentation of spatial risk and disease prevention levels and balancing and managing resource supply and demand, as well as social-emotional guidance and panic removal, providing strong spatial information support for decision-making, summary measures and assessment of COVID-19 prevention and control effectiveness (Zhou et al., 2020). COVID-19 is characterised by a long incubation period, strong transmission and difficult detection, leading to sudden and rapidly developing outbreaks. The situation requires GIS and big data technologies to enable rapid response and analysis, rapid provision of epidemiological information and understanding of epidemic development regulations to provide timely support for prevention and control of coronavirus decisions and actions (Zhou et al., 2020).

Many pandemics, such as the SARS-CoV epidemic and influenza, have utilised GIS and other methods, including a real-time mapping or real-time online case disease and social media reaction to the spread of disease, prediction risk mapping using population travel data and search and mapping of super-spreaders and contacts across space and time. The most referenced applications, which contain organised international information, and the first to go online are from Johns Hopkins University (available at https://coronavirus.jhu.edu/map.html; Pardo et al., 2020). Figure 2 shows a screenshot of Malaysia's Dashboard on COVID-19 using ArcGIS Online. The application can trace the spread of COVID-19 cases in real-time while providing map-matric dashboard data. All the data were collected from various sources, such as the WHO, the United States Center for Disease Control and Prevention (U.S. CDC), European Centre for Disease Prevention and Control (ECDC), Chinese Centre for Disease Control and Prevention (CCDC), China's National Health Commission (NHC) and Dingxiangyuan (DXY, China; Kamel Boulos & Geraghty, 2020). The technology will provide essential information on the source of new diseases, dynamics and epidemiologies and will shape our effective response to them. Therefore, health sectors should consider a conventional mapping of geographic accessibility to accommodate,

manage and assist in combatting pandemic outbreaks. As the disease moves quickly, the information should move more quickly. Thus, the map-based dashboard becomes more important in such matters.

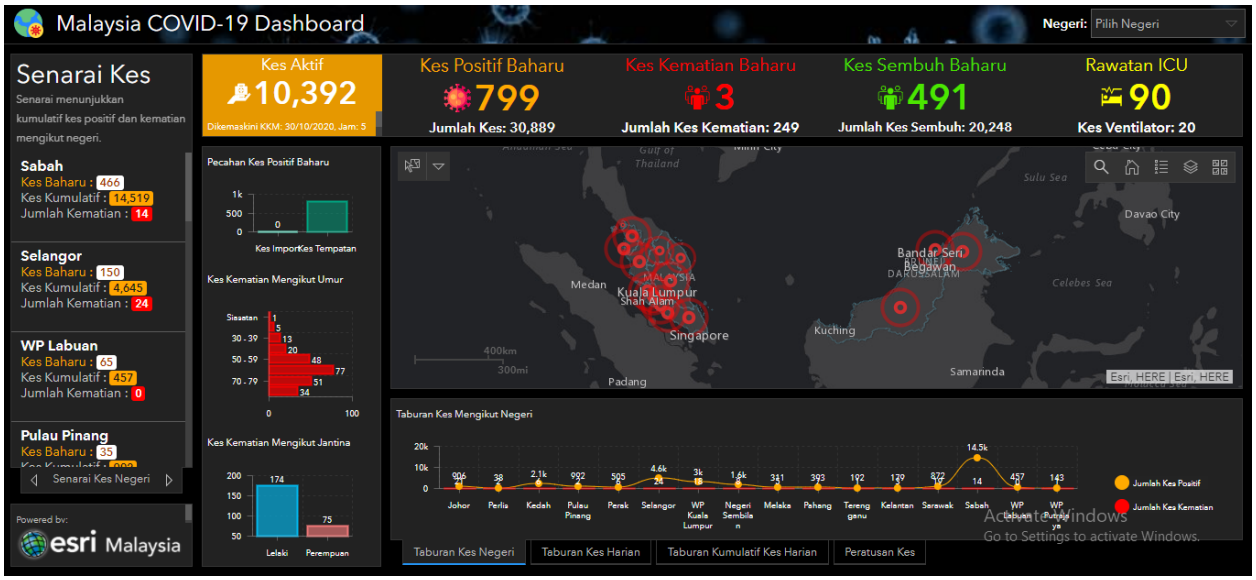

Figure 2: *Screenshot of Malaysia COVID-19 Case Spread Tracking by Esri Malaysia Using ArcGIS Online*
Source: Screenshot (31 October 2020).

HealthMap is one of the applications using GIS and big data technologies as an alternative for analysing and mapping online. The GIS contains important information, such as showing locations and how many in the population are covered by the healthcare network to be used in effective healthcare planning (Luis & Cabral, 2016). Based on Kamel & Geraghty (2020), HealthMap was founded in 2006 by a team of epidemiologists and software developers at the Boston Children's Hospital in the United States using mass media sources, such as news media and social media, for current monitoring of public health threats. HealthMap can offer an 'outbreak' feature that tells individual users about the risk of infectious disease based on their current location as obtained from their web browser or smartphone. Figure 3 shows a screenshot of pandemic outbreaks in the world using HealthMap. Every colour represents a different type of disease, such as the flu and Ebola. Therefore, it can be useful as a resource locator to identify residents of affected areas and to find essential help and resources (Kamel & Geraghty, 2020). Moreover, the applications and maps can display information and navigation to hospitals with available beds and clinics offering medical assistance along with waiting time, retail and open pharmacy, places to buy

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protective equipment and more. In highly impacted cities, this information can improve revenue and save lives. This is a best practice for promoting geography accessibility in epidemic management. Similarly, if there is a shortage in healthcare facilities, it can recommend the selected location for a certain purpose, whether for emergency treatment units or fixed infrastructure, by using GIS technology (Kamel & Geraghty, 2020). For example, when Wuhan faced a shortage of treatment facilities, authorities constructed two new hospitals with a total of 2,600 beds based on the GIS site selection. The information is provided by country reports on their health systems' performance in the community each year using key dashboard metrics (e.g. health outcomes, system trust, system competency and user experience), along with financial and equity protection measures (Kruk et al., 2018). In sum, the introduction of technology to increase geographic accessibility will support pandemic management for all countries including Malaysia. Accessibility is an important indicator of disease control to a healthcare provider.

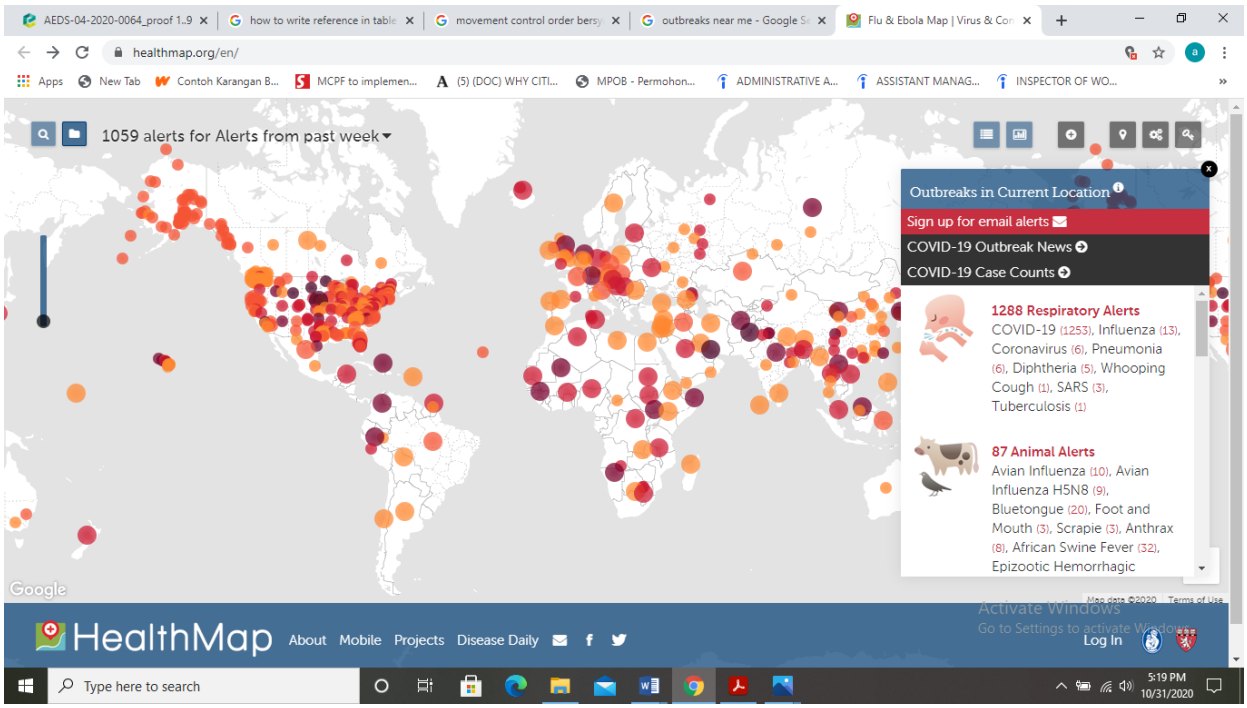

Figure 3: Screenshot of HealthMap's 'Outbreaks Near Me'
Source: https://www.healthmap.org/en/ (*Screenshot date*, 31 October 2020)

Several hospitals and clinics were designated as the only facilities to handle COVID-19 patients across Malaysia. This was done to isolate COVID-19 patients from other medical cases to ensure the right procedure was applied to handle the infected patients while also protecting others. Many patients were placed in other quarantine sites that are in operation to treat and control the disease. Rapid polymerase chain reactions (RT-PCRs) in patients and contacts were developed to be used and distributed in several government hospitals and medical laboratories. In Malaysia, 12 hospitals have laboratories designated to treat COVID-19 and 57 others that can conduct screenings (FMT, 2020). As a result of the COVID-19 pandemic, 57 government hospitals and 170 health clinics across the country have been prepared to conduct health checks on those with COVID-19 symptoms. Private hospitals, hospitals under the Ministry of Defence and university hospitals are working together to prepare for future COVID-19 cases.

Moreover, if the number of COVID-19 cases increases beyond the capacity of the participating hospitals, other hospitals have been identified for transformation into temporary isolation and quarantine centres as needed (Timeline News, 2020). GIS has created a website that provides all information related to COVID-19. For example, COVID-19 GIS HUB MALAYSIA, a GIS technology application for the COVID-19 pandemic provided by Esri Malaysia, is a GIS hub portal data-sharing platform related to COVID-19 in Malaysia and around the world. Among the information available from this website are the latest statistics of COVID-19 Malaysia based on Ministry of Health information and a 'Risk Population Distribution Map in a Red Zone Area', which can be searched for any facility, and the results will include locations within a five-kilometer radius. Figure 4 shows the 'Map of Risk Population Distribution Map in Red Zone Area'. Red zones represent total COVID-19 cases ranging from 39 to 500, orange zones represent a range of 9 through 39 cases, and yellow zones indicate the number of cases ranges from 1 to 9. The area without colour contains no COVID-19 cases. Figure 5 shows the distribution of hospitals, quarantine centres and other facilities offering COVID-19 treatment. The GIS application is very helpful in identifying which spaces are social priorities, using information based on places that is sensitive to context, social and social sustainability, and economic and environmental dynamics that affect a particular community (Samuelsson et al., 2020). The mapped output may contribute to policy implication and future decisions on healthcare planning. Critical areas that lack the necessary infrastructure can be analysed, and this information can help the government take appropriate action to channel current aid for pandemic relief.

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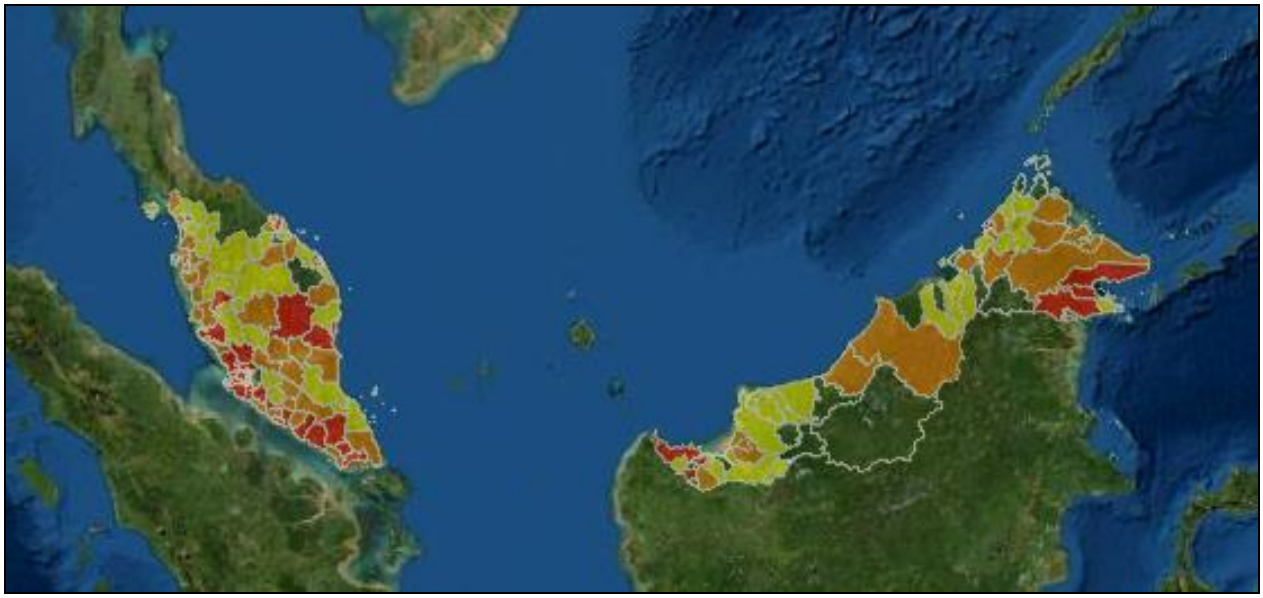

Figure 4: Malaysia Risk Population Distribution Map in Red Zone Area as of 5 November 2020
Source:
https://coronavirusnsesrimy.hub.arcgis.com/app/8f12b208c74742349eba87f8275e292c

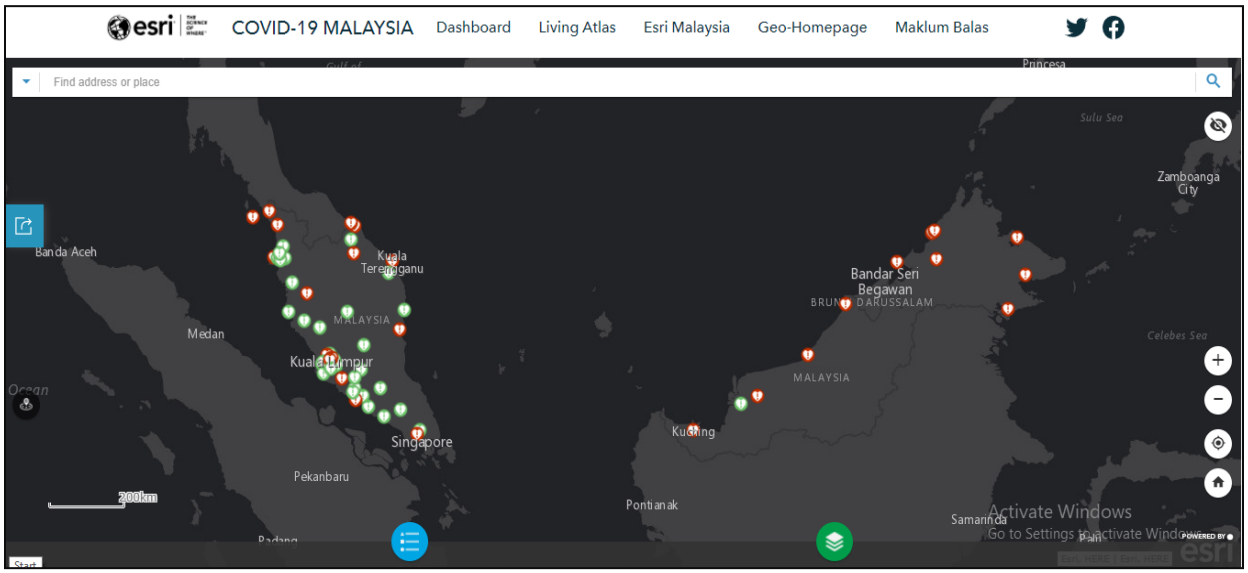

Figure 5: *Distribution of COVID-19 Hospital Map, Quarantine Centre and Other Public Facilities in Malaysia*
**Note*: Screening Only; Screening and Admitting
Source:
https://coronavirusnsesrimy.hub.arcgis.com/app/b6f5f53512d04101bbbb49f86a49284c

The COVID-19 outbreak crisis brought a huge catastrophe to the Malaysian economy. The infected sectors include tourism and related areas, the domestic economy, transportation and businesses as a result of the movement control orders (MCOs). The MCOs was rolled out on 18 March 2020, requiring the closure of all businesses except those providing essential services and items. Enforcement of the order was tightened progressively, resulting in significant improvement of compliance, while other interventions such as tracking of potential contacts and medical screening were underway, and the media continued to provide updates and general advice (Tang, 2020). Travel and tourism and related sectors such as accommodations (hotels) were expected to be among the most affected in Malaysia, in addition to oil and gas and other export-oriented industries (Duddu, 2020). At present, some specific antiviral strategies are in place, but several candidate antiviral drugs have drawn urgent investigation (Guo et al., 2020). The rapid spread of this epidemic is partly due to the lack of relevant information about the actual needs of patients, particularly, geographic facilities in the healthcare infrastructure. Another initiative to overcome pertaining to the epidemic is the development of a national health map that considers physical parameters, including geographic access. The health geographic map can facilitate the ability of infected parties to obtain treatment through the right channels. The WHO has suggested several preventative measures in treating the contagious disease, which differ according to the level and complexity of healthcare facilities between countries. They also provide guidelines for managing specific epidemics as well as for any new pandemics based on their research. COVID-19, which is a new infectious disease without a vaccine, is also under the surveillance of the WHO. All infected countries should follow the instructions and guidelines provided by the WHO to stop the spread of the disease. Proper action has been taken by the Malaysia Ministry of Health to manage the COVID-19 outbreaks following WHO recommendations. However, Malaysia had already implemented necessary measures to prevent the spread of the novel coronavirus (2019-nCoV) before the WHO's announcement that the outbreak constituted an international emergency as a result of the drastic increase in coronavirus infections and deaths, for example, requiring every person who entered the country from abroad to be quarantined for 14 days in special centres for precautionary measures.

The government has been striving to control this dangerous epidemic by introducing a variety of initiatives and alternatives. Before a vaccine is found, the only way to reduce or prevent infection in people is to raise awareness of risk factors and educate people on the steps they can take to reduce exposure to the virus by reducing the risk of human-to-human transmission. They can reduce the risk of infection, protect themselves and prevent the spread of the virus by practising hand hygiene, covering their coughs and sneezes, maintaining distance from sick people and vice versa. As the number of cases continues to rise, public health measures must move from containment to mitigation. Today, the health ministry is working hard on rapid identification of

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cases, contact tracing, testing of samples, isolation of confirmed and suspected cases and mobilisation of resources to stop the pandemic. Although the number of cases has decreased, people still need to maintain and practice all the precautions to avoid creating a new cluster. Thus, MCOs, CMCOs and RMOs can be implemented as an alternative to manage the pandemic before the situation worsens. Consequently, full cooperation and understanding from the public are urgently needed to succeed in the mission of reducing the risk of spreading COVID-19.

5. Conclusion

In conclusion, it is essential to provide adequate information and assistance in dealing with the contagious pandemic. Strict monitoring of virus detection, how it adapts and its pathogenesis, transmission and evolution should be done strictly and continuously. To improve healthcare capabilities, various supports need to be allocated from national budgets or help needs to be obtained from international organisations and nearby countries. Also, the preparedness of geographic accessibility in terms of healthcare facilities is also important to control the spike of outbreaks of the pandemic, as it allows people to get the right treatment at the right time and right place. For instance, the location and name of the listed hospitals to treat this special case should be explained and conveyed through a map for reference. The collaborative effect of many agencies is needed to supply the data to contribute to the creation of more comprehensive online information to prevent the spread of the disease on a large scale. While awaiting the discovery of a vaccine, immediate steps must be taken by any government in the region. COVID-19 containment is the number one priority for all ASEAN members. Efforts to curb this virus should cover all aspects in terms of health, economy and social well-being. Therefore, action to strengthen future collaboration should be implemented with a more coherent, multi-sectoral, multi-stakeholder approach within the entire ASEAN community to ensure a timely and effective ASEAN response to the epidemic. Health geography shows that GIS is important to meet citizens' needs at the level of local areas, neighbourhoods and villages, as it has been proven to have very strong usability. Research in health geography should be developed in terms of topics and field of study, because of its ability to map the health infrastructure and accessibility, and for regional planning in terms of location and allocation of health services. Health geography will accommodate the recognition of the importance of context, setting and spatial scale from global to local in determining health outcomes. Furthermore, public information campaigns, available in all countries as assessed by the Oxford COVID-19 Government Response Tracker (Oxford COVID-19 Government Response Tracker, 2020), can provide the benefits of the digital sphere to expand and update daily information for the entire population. Thus, by using the technology, the process can be faster, more

accessible and accurate. On the other hand, the government should ensure the health centres and medication to treat COVID-19 patients are accessible and sufficient for all classes of people and locations. In addressing complex health issues, an integrated and innovative multidisciplinary approach is crucial to ensuring researchers provide relevant and high-quality evidence to inform health policy. Cooperation between healthcare professionals, geographers, researchers and others can help maintain an innovative approach to solving complex problems and ultimately reduce inequality.

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