An Exploratory Study Into Perceptions of the Impact COVID-19 Has Had on Sustainable Development Using Concept Mapping

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Abstract

COVID-19 affected the pursuit of sustainable development in multifaceted ways. This study presents eight clusters of perceived impact of the pandemic and duration of respective impact that constantly developed 'new normal' to cope with unprecedented disruptions. The exploratory research applied the bottom-up approach where Concept System® Global MAX™ software facilitated online brainstorming to generate diverse opinions. Gen Z individuals were prompted with the following excerpt, 'The COVID-19 pandemic has disrupted the world and led to unprecedented change. How do you believe this has impacted either positively or negatively, the global pursuit of sustainable development?’ Their opinions were analysed and reduced to generate unique statements for subsequent data collection, where participants sorting the items into thematic clusters before rating each of them. Subsequently, multidimensional scaling and cluster analysis is performed using Concept System® to propose eight-cluster solutions. In the pursuit of sustainability, this study suggested that the pandemic have contribute positive Impacts on environment and Development of ICT infrastructure, while highlighting negative and long-term Impacts on Economy and Impacts on Wellbeing on overall. This community-based participatory research provides explicit recommendation in prioritising response for managing the unprecedented effects of the pandemic.

Introduction

Unsustainable development puts humanity at risk. Many communities across the globe are experiencing unprecedented challenges due to the COVID-19 outbreak. Extensive deforestation, agricultural expansion and infrastructure development has is the results of this exploitation of wild life and nature and somehow animal-borne viruses have found its way to make humans sick (Davidson, 2020). From the interest of sustainable development, the mass disruption to the business-as-usual urgently calls for sustainability to be built into the comeback. For instance, a recent article from the Intergovernmental Platform on Biodiversity and Ecosystem Services (IJPES) suggested that business-as-usual should allay for the impact of pandemic because the likelihood for future pandemics (Settele, Diaz, Brondizio, & Daszak, 2020). World Livestock 2013 report by the United Nation's Food and Agriculture Organization (FAO) suggests 70% of the novel pathogens/diseases emerging in humans are zoonotic in nature. There are about 1.7 million unidentified viruses capable of infecting humans that are residing in mammals and water birds (Davidson, 2020). Furthermore, we have not accounted for ancient viruses that have been locked away but now released from the melting of glacier and permafrost due to global warming (Glick, 2004). Therefore, how about viewing the COVID-19 pandemic as an opportunity to hit the reset button to resume the pursuit of sustainability and rebuild a global economy that prioritises the triple bottom line while inheriting resilience that comes with this experience? This study thus adopts a grounded theory approach to explore the impacts of the COVID-19 pandemic on efforts of sustainable development in a developing country, namely Malaysia.

Like most developing countries, the Malaysia Government pursue rapid economic and technological development with environmental sustainability coming second to profit maximisation. Malaysia is recognised as a biodiversity hotspot (Convention on Biological Diversity, 2020), however the many mammals are potential virus carriers. The interaction between humans and nature is inevitable and the adaptability of viruses in the human-wildlife interfaces have resulted in several outbreaks that have caused illness or deaths and major economic losses. Back in the year 1999, the Nipah virus outbreak in Malaysia [a viral infection - carried by fruit bats] spilled over into a large pig farm in Negeri Sembilan. Wild fruit bats fed on the fruit trees and the pigs became contaminated by infectious bat saliva, urine and faeces. Many of the patients who were infected worked in close contact with the infected pigs and 105 out of 265 patients did not survive the virus (Ang, Lim & Wang, 2018; WHO, 2018). Thus, the Nipah virus reported a case fatality rate between 40 and 75 percent (Gill, 2020). The case fatality rate of the coronavirus is still emerging, and the current estimates is under 1 percent. However, the continued encroachment upon nature through a lack of sustainability seem to indirectly suggest that we should brace for the emergence of other infectious viruses if we do not adopt pro-environmental behavioural change.

Despite so, the pursuit of sustainable development could be inhibited by economic recession owing to the financial shock from the COVID-19 pandemic. Although it will take some time for the economy to return to a pre-crisis condition, this study intends to ‘reverse the lens’ to explore the positive or negative impacts of the COVID-19 pandemic on sustainable development from the perspective of Malaysian Generation Z. The study was conducted during the Movement Control Order (MCO) that was imposed throughout the country between April to July 2020. The national lockdown was a preventive measure to mitigate the risk of virus transmission and permitted travelling only for businesses that are categorised as essential services, or critical services for public health or safety set forth by the Prevention and Control of Infectious Diseases (Measures with the Infected Local Areas) Regulations 2020. The views of Malaysian Gen Z are targeted because they are expected to be more adaptive to technological innovation and will become future leaders who will develop and implement sustainability policies. It is also important not to forget that Gen Z is implicated by national debt accumulated by governmental measures to cope with the economic shock of the COVID-19 pandemic.

The paper continues with a literature review, however with the pandemic being a new and dynamic phenomenon that is still emerging, literature is scarce and likely to change. Proceeding this, the selected method of concept mapping is examined followed by the results. The
subsequent section of discussion then attempts to interpret the findings from this exploratory study before the study is concluded.

**Literature Review**

Malaysia poses an exceptionally attractive context to examine sustainability efforts as the nation progresses towards becoming a high-income country by 2024 (The World Bank, 2020). Like many developing countries, economic growth has been accompanied by a lack of commitment towards sustainable practices and social responsibility within companies (Amran & Devi, 2007). There have been noticeable neglected environmental issues despite the existence of environmental policies (Zulkif & Amran, 2006; Preuss, Barkemeyer, & Glavas, 2016). During the pre-Covid-19 period, Malaysia concentrated on a comprehensive development towards becoming a developed nation by committing to economic development and economic social justice (Mahathir, 2018). Thus, presenting an enticing opportunity to investigate not only sustainability practices but also perception of what sustainability consists of. Furthermore, current sustainability literature that focused on the perspectives of Southeast Asian communities is lacking. Therefore, the Malaysian context offers unique insight whilst also offering a different values system compared to Western values, which are generally based on Judeo-Christian (Idemudia, 2011).

This section presents a chronological list of events to clarify the context of the study in greater detail. On the last day of 2019, a media statement by the Wuhan Municipal Health Commission reported cases of ‘viral pneumonia’ in Wuhan, China (World Health Organization, 2020). This virus was known as 2019-nCoV then. Whilst the initial outbreak had been primarily contained within China and more specifically Wuhan, the virus had crossed international borders and was spreading rapidly. From the 6th of February onwards, Malaysia imposed a travel ban from Chinese provinces that have been place on lockdown by their government. Due to the severity of the outbreak, the WHO declared COVID-19 a pandemic on the 11th of March 2020. The Prime Minister, Muhyiddin Yassin, announced the implementation of Movement Control Order (MCO) lockdown from the 18th of March to restrict movement of people so as to mitigate the alarming spread of the virus. Upon subsequent extensions, the restrictions were revised on the 4th of May and Conditional Movement Control Order (CMCO) was introduced to revive the economy whilst also taking precautions against a resurgence in the spread of the virus. This study was conducted during this period when MCO and CMCO were in place, where the effect of the virus upon day-to-day life was at its most prominent.

Owing to globalisation, the pandemic has knock-on effects on countries who are not severely affected by the viral infections due to the interdependence between both local and international supply chain partners. Ipsos (2020) conducted a study in which individuals from fourteen countries were asked whether, in the long-term, climate change was as serious as the COVID-19 crisis. The results revealed that from over twenty-eight thousand participants, that 71% of them agreed that climate change was as serious as the COVID-19 crisis. When asked about how much respondents agree that it is important for government to prioritises climate change, China and India represented Asian countries to report 87% and 81% of them agreeing, respectively, and positioned as 1st and 3rd in agreement among the 14 countries included. Ipsos further continued with their study asking, ‘In the economic recovery after Covid-19, it’s important that government actions prioritize climate change’ and the average agreement garnered for this statement is 65%. Once again, the two Asian nations claimed the top 3 ranks with India being 1st at 81% and China being 3rd at 80%, while most countries only averaged around 60% in agreeing to the statement. These results suggested that Asian nations are ready to break the business-as-usual practices once the COVID-19 crisis is over. However, following statement, ‘Government should focus on helping the economy to recover first and foremost, even if that means taking some actions that are bad for the environment’ by Ipsos MORI received 63% agreement from Indian participants, whereas a whopping 59% of Chinese participants disagreed to the statement. This suggested likelihood of different economic recovery approaches by Asian nations.

The disruption caused by the COVID-19 pandemic has led to many changes which have had positive and negative effects upon life and the pursuit of sustainable development. Some of the positive effects include, but are not limited to:

**CO2 reductions** – CO2 emissions reduced by an estimate of 6.4% compared to the global total in 2019. Cities and towns across the world undertook lockdown to control virus transmission. The coronavirus crisis records the first ever dip in carbon emission in 2020, more than during any previous economic crisis or period of war (Tollefson, 2021). Further studies suggest daily global CO2 emissions decreased by 17% in early April 2020 compared against 2019, with the peak by individual countries having decreased by an average of 26% (Le Quéré et al., 2020). This reduction was primarily contributed to by the aviation sector where daily activities reduced by ~75%, surface transport activities reduced by ~50% and industry and public sectors activity reduced by ~35% (Le Quéré et al., 2020). There was significant improvement in air quality (Rume & Islam, 2020; Kumari & Toshniwal, 2020). In fact, ASEAN’s transboundary haze issue did not make headlines in 2020. Nevertheless, this downward trend appears temporary as countries attempt to revive their economies after extended periods of ‘lockdown’. The battle against COVID-19 impelled change in the management of businesses to accommodate stay-at-home restrictions.

**Wildlife Recovery** – With national lockdowns reducing human activity, there have been many reports of recovery for the wildlife. As the coronaviruses are zoonotic and can spillover to the human population through wild animals and livestock, Borzée et al. (2020)
recommended that government legislations must be effective in protecting wildlife and their habitat, including regulating the wildlife trade. In 2020, dolphins were spotted further up the Bosphorus in Istanbul, Turkey which is normally one of the world’s busiest marine routes (BBC News, 2020). In the East Coast of Peninsular Malaysia there was more than 70% increase in turtle landings at the sanctuaries compared to the same period in the previous year (Bernama, 2020). With less human interference wildlife appears to be venturing back into domains which were once theirs. The changes in land use for agriculture tipped the balance in the relationship between wildlife-livestock-human. These pre-existing issues and the exploitation of wildlife for trading continues to trigger the onslaught of infectious disease. The COVID-19 pandemic made the world pay attention to the risks of zoonoses.

Some of the negative impacts of the corona virus crisis include but are not limited too;

**Global economy** – The FTSE, Dow Jones Industrial Average and the Nikkei have all seen huge falls since the outbreak began on 31 December 2019. The Dow and the FTSE saw their biggest quarterly drops in the first three months of the year since 1987 (Jones, Palumbo, & Brown, 2020). The prices of gold surged to a record high of USD2,070 per ounce in August 2020 as investors opted for safe-haven investment to hedge against inflation. There are suggestions that the developing nations will be the hardest hit through a combination of the following: a fall in commodities prices (i.e., oil), withdrawal of international investment, increase in foreign debt as local currency is devalued, unable to conduct informal work (i.e., street vendors) or a decline in remittances being sent to home country (Walker, 2020). The Asian Development Bank suggests that developing Asian economies are going to be particularly affected through sharp declines in domestic demand, lower tourism, and business travel and/or supply disruptions (Abiad et al., 2020).

**Unemployment** – Countries across the world implemented lockdowns or restricted movement to control non-essential travel in effort to contain the COVID-19 outbreak, albeit effective, it takes toll on survival and continuity of businesses. This unprecedented situation led to job loss across many industries. In the United States, the unemployment rate hit a record high where an estimated thirty million people filed for unemployment benefits in six weeks between the middle of March 2020 and the beginning of May (Jones et al., 2020), signalling the end to a decade of job growth for one of the world’s largest economy. The Department of Statistics of Malaysia reported that unemployment rate increased to 4.8% as of Dec 2020 and this is significantly higher compared to an average of 3.3% in the last two decades (DoSM, 2020). The number of jobs required by private sector declined by 204,000 when compared to the year before. This could be attributed to some 32,000 SMEs that closed during MCO (Tan, Sivanandam, & Rahim, 2019). In fact, the service industry offers more that 50% of jobs in the market and restriction of movement pose difficulties to business as usual, suggesting that imminent change is required for business continuity.

**Plastic waste** – Plastic pollution is a challenge even for developed nations. According to a Greenpeace Malaysia report, toxic contamination is evident at numerous plastic recycling or disposal sites used for processing imported plastic waste from Australia, the United States of America, the United Kingdom, Germany, France, Japan and Scandinavian countries. Malaysia generates high plastic waste per capita and poor recycling rate (MESTEC, 2019). Tons of single use plastics (SUPs) are generated throughout the pandemic especially personal protective equipment e.g., gowns, gloves and face masks (Hughes, 2020). Higher demand for virgin plastic is observed with lower oil price. The market for recycled plastic is further exacerbated in Europe and the US, where the plastic industry that has always capitalised on threat of cross-contamination in reusable plastics, have since benefitted from the COVID-19 situation by pushing back the policy to ban SUPs (Scaraboto, Joubert, & Gonzalez-Arcos, 2020). Companies like Starbucks banned reusable mugs temporarily, forcing customers to accept single use mugs (Carey, 2020). In reality, this situation stemmed from inadequate sanitisation system for take-out products. While the abovementioned issues are non-exhaustive, recovery plans have been unveiled to contain the impact of COVID-19. The International Institute of Sustainable Development (Florizone, 2020) suggested that recovery must consider three key points; that is resilience must be built into the system, economic stimulus needs to be sustainable, and the magnified inequality must be addressed. The following section discussed the methodology that was adopted to explore the impact of COVID-19 upon Malaysia’s sustainability efforts.

**METHODOLOGY**

This study focused on Malaysians who were born between 1997 to 2003, also known as Gen Z. They are more tech-savvy than the previous generations and have begun to inherit the sustainability and climate change challenges. The idea of capturing the thoughts of Gen Z is alluring because their perceptions of sustainability today will drive the regulative policies of tomorrow.

Concept mapping approach was chosen because the initial phase involved bottom-up exploratory research design where individual ideas are generated via brainstorming based on grounded theory. Subsequently, the concept mapping process progressed with statistically bringing the ideas together by cognitively grouping them to develop a visual conceptualisation. The process of concept mapping involves five stages; create statements, sort statements, run multi-dimensional scaling (MDS) of sorted units, run hierarchical cluster analysis (HCA),
and label the clusters (Kane & Trochim, 2007). The concept mapping process is a structural conceptualization method designed to organize and represent ideas from an identified group (Rosas & Kane, 2012). Therefore, the method adds structure to diverse and subjective ideas systematically.

**Create statements** – The Concept System® Global MAX® browser-based software that was used for this study offers an online brainstorming tool which was utilised for the initial collection of statements. An online poster was created to solicit responses from Malaysian Gen Z through various social media outlets. The brainstorming prompt question was *The COVID-19 pandemic has disrupted the world and led to unprecedented change. How do you believe this has impacted, either positively or negatively, the global pursuit of sustainable development?*. The number of statements collected was then reduced based on Keyword In Context (KWIC), followed by thematic analyses to present a list of ideas composing of preferably 80 to 100 statements (Homer, 2021). This process was appraised by both researchers to ensure the statements are shortlisted effectively whilst also reducing any bias.

**Sort statements** – The software was used to facilitate online sorting with Rosas and Kane (2012) recommending twenty-five to thirty participants for this stage. Sorting statements involved grouping statements into piles that makes sense to the individual. Researchers provide minimal guidance to participants during this stage so that they can express their inherent cognitive relationships amongst the statements. Some guides to enable this process include participants cannot single out any statements, participants cannot put all statements in one pile, and neither can participants form a pile for miscellaneous. Participants are required to name the groups they have formed. Subsequently, they rated the impact (-3: Strong Negative Impact to 3: Strong Positive Impact) and duration (1: Very Short Term to 7: Very Long Term) of each statement.

**Run MDS & HCA** – The data collected from the sort and rate exercises were analysed by The Concept System® Global MAX®. The software runs MDS to generate a ‘point map’ for all the statements, with statements that are positioned closer together were recurrently sorted into the same pile by participants. Next, the HCA was generated, however there is no definitive solution to the number of clusters that should be rightfully selected. This is a multifaceted decision-making process that needs to consider the research objective, the issue being investigated and the sensibility of the statements belonging together (Kane & Trochim, 2007). Both the clusters and the point maps were carefully reviewed and evaluated between the researchers to mutually agree on the cluster map solution.

**Label clusters** – Cluster names from individual respondents were collected during the sort statements stage. Thereafter, the Global MAX software generated the top ten most commonly used labels for each cluster and the researchers were given the option to adopt or adapt the most appropriate name upon reviewing the content within respective cluster.

**Results**

The brainstorming stage generated 115 ideas or statements, which were then reduced to 98 unique statements using the KWIC and thematic analysis. Whilst the list of statements presented in Table 1 is considerably large, the diversity of ideas resulting from the brainstorming exercise did not enable further reduction to minimise the risk of losing content. Next, thirty participants were recruited to participate in the sorting and rating exercise. The results from the MDS provided a stress value of 0.3238, which is within the acceptable threshold of 0.390 (Sturrock & Rocha, 2000 as cited by Rosas & Kane, 2012). This reasonably high stress value could be attributed to the complex and diverse nature of the statements. Figure 1 presents the point map that shows the location of all statements, with statements which are closer together have been grouped more frequently by participants. Next, the number of clusters was deliberated between researchers and eight clusters appeared to be the most appropriate solution. The most fitting labels to cluster were then adopted and/or adapted from a list of names generated by participants (refer to Table 1 and Fig. 2). The average ratings with regards to impact and duration for each cluster and individual statements are also presented by Table 1.
### Table 1
Statement and Rating Table

| #  | Impacts on Economy (Ratings; Impact: -1.94, Duration: 4.27) | Imp. | Dur. | #  | Impacts on Society (Ratings; Impact: -0.40, Duration: 3.70) | Imp. | Dur. |
|----|------------------------------------------------------------|------|------|----|------------------------------------------------------------|------|------|
| 1  | Higher crime rate due to rise in unemployment rate         | -2.03| 4.17 | 7  | Stress on working families to balance working at home and home schooling | -1.07| 3.14 |
| 16 | Low income group face highest risk of not being able to bring food to the table | -2.48| 4.52 | 8  | Compassion within the community led to communal production of PPE for front liners | 2.03 | 3.55 |
| 24 | High levels of unemployment and redundancies               | -2.10| 4.28 | 14 | Rise in domestic abuse                                       | -2.31| 4.07 |
| 30 | Social inequalities exacerbated through hardships           | -1.59| 4.31 | 27 | The Movement Control Order caused mass disruption to peoples lives | -1.38| 3.79 |
| 32 | Informal sector, such as street vendors and home workers, hit hardest by restrictions | -1.83| 4.31 | 31 | A sense of unity developed among communities               | 1.66 | 4.38 |
| 44 | Crash in the stock market affects pensions                 | -1.45| 4.03 | 53 | Seniors who are exceptionally vulnerable become isolated     | -1.86| 3.52 |
| 49 | Unscrupulous businesses profiteered from others' suffering | -1.86| 3.59 | 58 | Food produce taking longer than usual to arrive at stores due to restrictions in workers and movement | -1.07| 2.79 |
| 50 | Economic uncertainty means fewer jobs for graduates        | -2.21| 4.10 | 63 | Government in-fighting has led to a lot of uncertainty among citizen  | -1.52| 4.17 |
| 52 | Charities reliant on donations suffering financially from economic downturn | -1.72| 4.00 | 65 | Current difficulties will build resilience in the recovery | 1.14 | 4.59 |
| 60 | People who lost their job have to spend their savings or borrow money | -1.83| 4.38 | 72 | The importance of low paid and unskilled front-line workers become apparent | 1.21 | 4.48 |
| 66 | Many businesses will not open after the pandemic due to economic hardship | -1.83| 4.66 | 86 | People who practice religion have struggled to fulfil their spiritual needs with places of worship being closed | -0.97| 2.31 |
| 74 | Households have an increased risk of falling into poverty  | -2.10| 4.83 | 92 | All homeless put into shelters through Movement Control Order | 1.59 | 3.45 |
| 81 | Uncertainty due to the pandemic generated fear that has increased racism and discrimination | -2.10| 4.52 | 95 | Increased number of road traffic accidents as highways begin to open | -1.48| 3.41 |
| 82 | Indigenous people who were already marginalised have become even more vulnerable through the pandemic | -2.10| 4.24 | 97 | Subsequent wave and possibility of localised flareups of virus creates a lot of uncertainty | -1.55| 4.17 |
| 84 | High profile figures received lighter punishment for breaking lockdown measures | -1.90| 4.10 | | | |

| #  | Development of ICT (Ratings; Impact: 0.68, Duration: 4.41) | Imp. | Dur. | #  | Sustainable Responses (Rating; Impact: 1.28, Duration: 4.29) | Imp. | Dur. |
|----|------------------------------------------------------------|------|------|----|------------------------------------------------------------|------|------|
| 3  | Pandemic has pushed the development of 5G network to improve IT infrastructure | 1.83 | 5.59 | 4  | Opportunity for many people to stay at home and spend time with their family | 2.10 | 3.24 |
| 5  | Countries share their PPE resources with each other to encourage each other to fight this pandemic together | 2.03 | 4.28 | 9  | Many factories converted their operations to produce PPEs (hand sanitisers, masks, etc.) to cater for the overwhelming demand | 1.21 | 3.17 |
| 6  | Countries share information with each other on how to combat the virus in order to fight this virus together | 2.31 | 4.52 | 10 | Increased awareness of hand hygiene and contact transmission of virus | 2.17 | 4.76 |
| 11 | Many online learning platforms and learning archives are made free to the public | 2.10 | 4.45 | 26 | The disruption caused by pandemic has driven innovation within industry | 1.90 | 4.93 |
| 13 | Time differences between Malaysia and other countries causes problems for international students | -0.79| 2.83 | 28 | Covid-19 pushed the 4th industrial revolution with working from home and automation | 1.86 | 5.45 |

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| #  | Impacts on Economy (Ratings; Impact: -1.94, Duration: 4.27) | Imp. | Dur. | #  | Impacts on Society (Ratings; Impact: -0.40, Duration: 3.70) | Imp. | Dur. |
|----|-----------------------------------------------------------|------|------|----|-----------------------------------------------------------|------|------|
| 15 | Some students do not have internet access to attend online classes | -2.10 | 4.21 | 43 | Unprecedented consumption levels of media to keep people entertained whilst staying safe indoors | 0.34 | 3.76 |
| 18 | The use of online platform for classes resulted in efficient use of resources | 1.14 | 4.86 | 48 | The economic down turn from the pandemic has exposed flaws in the current capitalist system | -0.03 | 4.45 |
| 46 | Tech firms such as Zoom have had massive growth | 1.41 | 4.41 | 70 | Increased human-nature interaction leads to increasing regularity of endemic and pandemic. | -0.21 | 4.10 |
| 61 | Children unable to attend early years school falling behind on crucial years of education | -1.97 | 4.10 | 71 | The UN Sustainable Development Goals are even more important to stop recurrence of similar pandemics | 1.55 | 5.38 |
| 69 | Greater possibilities for international collaboration as governments need to tackle a global problem | 1.59 | 4.31 | 75 | Business leaders must now turn Environmental, Social and Governance talk into long-term results | 1.34 | 4.86 |
| 79 | The pandemic caused a huge change in delivery of education which will unlikely return to pre-pandemic ways | -0.03 | 5.00 | 87 | Reduction in smoking due to concern over respiratory problems from COVID-19 | 1.79 | 3.07 |
| #  | Impacts on Environment (Ratings; Impact: 0.78, Duration: 3.67) | Imp. | Dur. | #  | Impacts on Wellbeing (Ratings; Impact: -1.49, Duration: 3.69) | Imp. | Dur. |
| 17 | Increase of plastic due to high demand of F&B delivery service | -2.03 | 4.48 | 12 | People were unable to carry out their exercise routines at parks and gyms without adhering to MCO rules | -0.83 | 2.48 |
| 20 | Less human activity has allowed nature to flourish | 2.21 | 3.28 | 22 | Increased mental health issues | -1.79 | 4.86 |
| 23 | Reduction in recycling of plastic as price is linked to oil price | -0.86 | 3.86 | 29 | Slower internet speed in Malaysia due to surge in bandwidth demand | -1.31 | 3.24 |
| 25 | No guards/rangers for endangered species because of social distancing measures leaves them vulnerable | -1.17 | 3.17 | 45 | Increased risk of national and global recession | -1.62 | 4.76 |
| 33 | Turtles returning to Malaysian beaches through lack of human activity | 1.79 | 3.28 | 47 | Global supply chains having a knock-on negative impact as factories close | -1.69 | 4.10 |
| 34 | Growing societal pressure to ensure COVID-19 recovery is 'green' | 1.48 | 4.34 | 54 | Refugees are particularly exposed to risks of COVID-19 | -1.83 | 3.93 |
| 35 | The pandemic has increased awareness about the need for sustainable development | 2.07 | 4.52 | 55 | Illegal/overstayed immigrants pose high risk as they do not wish to reveal themselves to the authorities | -2.00 | 4.03 |
| 38 | The reduction in CO2 emissions from lockdowns could enable achievement of global warming targets | 1.97 | 3.07 | 56 | Those who are not digitally savvy struggled with day to day life through lockdown | -1.45 | 3.93 |
| 42 | Significant improvement in air quality | 1.93 | 3.41 | 57 | Non-citizens on visa unable to return to Malaysia for work or study | -1.38 | 2.93 |
| 51 | Maintenance of natural reserve and zoo animals is financially dependent on number of visitors. | -1.17 | 3.69 | 80 | The international tourism industry has no customers due to closed borders | -1.93 | 3.62 |
| 62 | Wildlife gets a chance to recover | 2.38 | 3.86 | 83 | Proposal to subsidise holidays post-pandemic may leave some countries at a disadvantage | -1.14 | 3.90 |
| 64 | A newfound respect for nature | 1.97 | 4.34 | 85 | Individual rights were taken away during Movement Control Order | -1.41 | 2.76 |
| 77 | Used face masks and gloves ends up in the ocean | -2.03 | 4.69 | 93 | Refugees cannot get into Malaysia because the border is closed | -0.45 | 3.41 |
| #  | Impacts on Economy (Ratings; Impact: -1.94, Duration: 4.27) | Imp. | Dur. | #  | Impacts on Society (Ratings; Impact: -0.40, Duration: 3.70) | Imp. | Dur. |
|----|----------------------------------------------------------|------|------|----|----------------------------------------------------------|------|------|
| 88 | Beaches are cleaner due to reduced visitors and litter. | 2.07 | 3.24 | 94 | Some citizens not following government lock down rules and potentially spreading virus | -2.00 | 3.76 |
| 89 | Reduction in noise pollution through lockdown measures | 2.03 | 2.86 | | | | |
| 90 | Fishing fleets not at sea because of restrictions | 0.90 | 2.79 | | | | |
| 91 | Water quality has seen improvement through reduced pollution during the pandemic | 2.28 | 3.17 | 2 | Higher rate of dengue infection | -1.55 | 3.07 |
| 98 | Cargo and cruise ships produce localised pollution as engines left running whilst waiting in coastal areas | -1.76 | 3.93 | 19 | Medical institutes are overrun leading to poor patient treatment | -1.86 | 3.24 |
| #  | Shocks to Norms (Ratings; Impact: -0.18, Duration: 3.38) | Imp. | Dur. | 40 | Increased preventable deaths due to cancellation of routine medical treatments | -0.59 | 2.97 |
| 21 | Oil and commodity prices are low | 0.28 | 2.48 | 67 | Increased borrowing by governments to support national economies | -0.79 | 4.31 |
| 36 | Drastic reductions in city traffic | 1.62 | 2.38 | 73 | High risk to medical and healthcare workers due to close contact with COVID-19 cases | -1.45 | 4.17 |
| 37 | Huge over capacity in air travels | -0.31 | 3.38 | 76 | Increase in counterfeit personal protective equipment and medicines | -1.00 | 3.21 |
| 39 | Mass transport disruption allows easier transition to more cycling and walking | 1.28 | 3.14 | 78 | Issues in global institutions, such as World Health Organisation, have become apparent under the consistent strain from the pandemic | 0.93 | 4.69 |
| 41 | Increased demand and use of electricity | -1.03 | 3.97 | 96 | Government should be open to criticism over response to corona virus | 1.31 | 4.31 |
| 59 | Possible increase in illegal logging as a lack of enforcement during lockdown | -1.38 | 4.07 | | | | |
| 68 | There will be a rush to recoup economic losses without concern for sustainability once the lockdown is lifted. | -1.72 | 4.28 | | | | |

The ratings for impact and duration were presented differently from the typical concept mapping approach where each cluster is usually represented by stacks of layers. Instead, Fig. 3 presents the results using the scatterplot with x-axis (duration) and y-axis (impact), where the mid-point for both ratings divided the statements into four quadrants. The quadrants, moving from the top right to the top left quadrant in clockwise direction, are categorised as long-term positive impacts, long term negative impacts, short-term negative impacts and, short-term positive impacts, respectively. Using the information on Table 1 and Fig. 3, this study effectively interpreted the Malaysian Gen Z’s opinion towards change resulting from the unprecedented effects of the pandemic.

**Discussion**

The results present diverse findings because a grounded approach was used to conduct this research to solicit opinions on the impacts COVID-19 on sustainability without restrictions. This created a broad conceptualisation, followed by the card sorting exercise where individual participants demonstrated their cognitive relationships between each statement, followed by the rating exercise to prioritise the reactive response towards these impacts. The following sub-sections analyse the cluster themes and their inherent statements.

Impacts on Environment – It was natural that environment was highlighted since COVID-19 pandemic was strongly attributed by mankind’s encroachment on natural habitats. Out of 18 statements within the cluster, 6 items reported negative impacts. Participants raised concern over plastic pollution from online delivery services and used PPEs. While most of the statements were clearly positive or negative in impact, some statements were inconclusive such as #90 ‘Fishing fleets not at sea because of restrictions’ (mean = 0.90) and #70 ‘Increased human-nature interaction leads to increasing regularity of endemic and pandemic’ (mean = -0.21). The reduction of fishing activities facilitated...
recovery of marine environment. The wildlife, also experienced recovery due to reduction of human activities. These positive impacts are at best temporary improvement because lockdown only postponed human activities and did not offer alternative solution for sustainable consumption. Based on participant’s subjective assessment, the main forms of pollution such as air, water, soil and noise appeared to be under control during short-term restrictions.

Development of ICT – As with most countries, the various types of movement restrictions due to COVID-19 pandemic forced millions of workers to embrace remote working and learning. The capabilities of information and communications technology (ICT) infrastructure that support video conferencing and virtual collaboration applications is required to minimise disruption to businesses. This cluster covers a broad range of activities, where IT facilitates communication and information sharing in mitigating the spread of COVID-19. ICT have enabled online learning, but the digital divide experienced by rural and urban schools was exemplified by a viral news story of a student, who lives in the Malaysian state of Sabah, and was determined to sit for her online exam by securing connectivity to the network from the treetops (Lee, 2020). Such stories showed disparity of broadband access across the country apart from other challenges such as assess to e-learning system and gadget shortage. Nonetheless, the positive contribution of digital transformation at the retail industry did not go unnoticed although this cluster has not highlighted the impacts of e-commerce across various segments of the population.

Sustainable Responses – This cluster is located at the centre of cluster map and seemed somewhat of a mix of ideas. The statements within the cluster are transitional in nature, for example statements such as #26 ‘The disruption caused by pandemic has driven innovation within industry’ and #75 ‘Business leaders must now turn Environmental, Social and Governance talk into long-term results’ demonstrate the urgency to innovate and adopt sustainable approaches that challenges the status quo of doing business. The average duration of this particular clusters is second highest at 4.29, suggesting that this pandemic is building resilience into business as usual for future generations. This includes becoming receptive of sustainability-oriented business model, as seen in #71 ‘The UNSDG are even more important to stop recurrence of similar pandemic’.

Shocks to Norms – Lockdown have proven that a healthier ecosystem and cleaner air is possible with reduced human activities. This cluster highlights disruptions in demand for transportation services, where the ‘new normal’ has slowed down the momentum of city traffic and air travels. In reality, the travel industry is profoundly affected by the unprecedented crisis and the Malaysian government have announced tax relief for domestic travel expenses incurred between March 2020 to December 2021. With regards to higher demand for energy, this was attributed to surge in domestic consumption during lockdown period as people spent more time indoors. Albeit temporary in negative impact, renewable energy source only account for 2% of total mix generated by the Malaysian energy industry (Abdullah, Kadir, & Verayiah, 2019). The Kuala Lumpur City Hall's (DBKL) have since imposed 30% reliance on renewable energy for future commercial and residential development projects to cut back on electricity cost (Bavani, 2020). This cluster also warned that #68 ‘There will be a rush to recoup economic losses without concern for sustainability once the lockdown is lifted’. It maybe that in the pursue of rapid economic recoveries around the world, any sustainability gains achieved diminishes in order to recoup losses.

Impacts on Society – Whilst this cluster has a mix of both negative and positive impacts leading to an average impact rating of -0.40, it does pick up upon some key elements that are specific to the way government and stakeholders respond to the COVID-19 pandemic. #92 ‘All homeless put into shelters through Movement Control Order’ showed that the plight of marginalised communities did not go unnoticed. The community spirit among Malaysian residents is highlighted, whereby #8 ‘Compassion within the community led to communal production of PPE for front liners’. Nevertheless, the #63 ‘Government in-fighting has led to a lot of uncertainty among citizen’ and the presence of deadly variants threatens the nation's recoverability from the third wave infection. Leadership is crucial in the decision making in collectivist culture but the mixed messages from ministers and the lack of enforcement to an already inadequate standard operating procedures are not helpful for quick recovery. Additionally, opposition parties are supposed to keep the ruling government in check but their differences and self-serving interest appear to be failing the people of Malaysia.

Impacts on Economy – The impacts towards business and national economies have been felt across the globe. The lockdown restrictions extend the threat of recession in Malaysia. At least 1.36 million individuals (9.4% total workforce) who works in the informal sector (DoSM, 2017) are at risk of losing income due to temporary (or permanent) business closures. The #32 ‘Informal sector, such as street vendors and home workers, hit hardest by restrictions’, and #66 ‘Many businesses will not open after the pandemic due to economic hardship’. This led to #74 ‘Households have an increased risk of falling into poverty’. The low income groups earns a minimum wage of 5.77 ringgits (US$1.36) (Ashley, 2020) and #60 ‘People who lost their job have to spend their savings or borrow money’ thus straining retirement funds and possibly risking their future. Therefore, the government, being aware that #16 ‘Low income group face highest risk of not being able to bring food to the table, recently approved one-off handouts under the PEMERKASA stimulus package to assist groups of people most affected by MCOs. Economic recovery of majority industries will take at least 5 years to return to pre-COVID-19 level. This statement coincides with the views of chief scientist of WHO, Dr. Soumya Swaminathan, who commented that it will take half-decade to control the crisis (CNBC, 2020).
Impacts on Wellbeing – The pandemic triggered #22 ‘Increased mental health issues’ among family member across all age groups, towards those staying together or separately. Extended restrictions induced seclusion and this condition does not sit well among collectivist culture. #56 ‘Those who are not digitally savvy struggled with day to day life through lockdown’ but many have quickly embraced video conferencing software and online shopping platform on their smartphones. In the beginning, #57 ‘Non-citizens on visa unable to return to Malaysia for work or study’ but later on, entry was permitted to returning nationals and special long pass holders, with mandatory quarantine and valid RT-PCR COVID-19 negative. Additionally, total number of foreign workers in Malaysia ranged from 2.96 million to 3.26 million in 2017 (Loh, Simler, Wei, & Yi, 2019), as well as some 178,140 refugees and asylum seekers registered with UNHCR in Malaysia (UNHCR, 2020). Their social welfare and healthcare are equally important because virus variants do not discriminate between people. Everyone must be entitled to affordable screening and free vaccination to take part in quick recovery responses for societal wellbeing.

Impacts on Healthcare – Similar to most countries, the concern for healthcare stems from what if the medical institutions become overwhelmed? then how will patients be prioritised to receive medical attention for various illnesses. Whenever the healthcare systems runs at or near capacity due to congestion, situations such as #40 ‘Increased preventable deaths due to cancellation of routine medical treatments’ becomes public health issues and limited intensive care unit (ICU) beds for emergency surgeries also raises humanity issues. If there were #2 ‘Higher rate of dengue infection’, the case of #19 ‘Medical institutes are overrun leading to poor patient treatment’ becomes inevitable. There is no justification for untimely death and healthcare management need the ruling government to cooperate in controlling the spread of virus. #96 ‘Government should be open to criticism over response to corona virus’. With regards to international cooperation, this cluster also highlighted #78 ‘Issues in global institutions, such as World Health Organisation, have become apparent under the consistent strain from the pandemic’. WHO’s warning system on the international public health emergency must be reviewed due to its failure to curb the coronavirus outbreak.

The discussion continues by reviewing the ratings for both the impact and the duration of the individual statements. Figure 2 provides greater insight into the perspectives of Malaysian Gen Z on the effect of COVID-19 on sustainability. Whilst the scales on this plot are vague and subjective, the clustering of statements as well as the outliers allow for interpretation. Beginning with the short-term impacts, there is more clustering of both positive and negative impacts towards the mid-point (axis) which would suggest that these impacts are more towards a moderate time frame, rather than an actual short-term duration. With the positive impact having a second cluster slightly further away from the axis towards the longer term. The negative impacts appear to have a form of correlation, in that there is a tendency for the larger the perceived negative impact the longer the duration of the impact. Looking at the extremes of this demonstrates this further; the shortest duration and slightly negative perceived impact is statement #86 ‘People who practice religion have struggled to fulfill their spiritual needs with places of worship being closed’, which will be resolved quickly as soon as lockdowns are lifted. Whilst the at the other extreme, with a longer duration and largest perceived negative impact would be statement #16 ‘Low income group face highest risk of not being able to bring food to the table’. The issue faced here is that until the global economy recovers, there is likely to be a limited need for low skilled workers as Malaysia is very much manufacturing export-based economy.

The positive impacts, with the exception of a few outliers, appears to take a more horizontal format within the positive values of 1 to 2.5. There further appears to be two concentrations of the positive impacts within durations, one between 3 and 3.5 impact rating and another between 4 and 5 impact rating. The values here tend to move away from the short term with those in the 1st cluster being mid-term duration, as they are next to the central axis, whilst the second grouping appears to be moving towards the longer term. Thus, the pattern here is in stark contrast to the negative impacts. There are also three statements within the positive impact which are outliers and appear to have a prolonged duration to other positive impacting statements. These are #3 ‘Pandemic has pushed the development of 5G network to improve IT infrastructure’, #28 ‘Covid-19 pushed the 4th industrial revolution with working from home and automation’ and, #71 ‘The UN Sustainable Development Goals are even more important to stop recurrence of similar pandemics’. All three of these statements are work-in-progress prior to the COVID-19 pandemic. However, their importance has now been thrust to the forefront and the positive impact they bring will resound for a prolonged period.

**Conclusion**

Within this study, a grounded theory approach was adopted to explore the perceptions of Malaysian Gen Z upon the impact COVID-19 pandemic would have upon the pursuit of sustainability. The results have demonstrated that the impacts of the COVID-19 have far reaching consequences and impact diverse aspects within the pursuit of sustainability, both negatively and positively. It is befitting that a lack of sustainability created the current pandemic situation, and it may well change the outlook upon sustainability in the future. It has now been estimated that it would have been 100 times cheaper to invest in sustainability to prevent the pandemic, than it is costing to cure the current pandemic (ipbes, 2020). Yet, with many of the positive impact being perceived to be materialise within moderate duration by the study’s participants, it maybe that there is a return to business as usual. In which case, a more debilitating pandemic is not highly unlikely.
Hopefully with the participants being Gen Z, who are more receptive about sustainability, these future leaders achieve more success at proactively incorporating sustainability within business practices or national-level policies.

This study has some associated limitations, first being the subjectivity involved, mostly within the initial qualitative brainstorming element. Whilst efforts were made to reduce the inherit subjectivity of the qualitative component, it cannot be fully removed however as this study remains within the conceptual domain this was not deemed decremental to the study's results. A further limitation comes from the cross-sectional nature of the study, with the pandemic being unprecedented and the future of its spread unpredictable, participants responded based upon their current knowledge at the time. Future studies may choose to track the progress of the elements raised within this study and evaluate whether the durations and impacts are consistent with the participants estimates.

**Declarations**

*Ethics approval and consent to participate.*

Ethics approval was granted by Sunway University Research Ethics Committee under the reference number SUREC 2020/058. Consent for the first stage (brainstorming) was achieved through presenting the participant information sheet (PIS) and a statement that the participants had read, understood, and agreed to the PIS. The second round of data collection was far more complex and required participants to have individual logins, thus a complete consent form was signed, and participants provided with a PIS to keep.

*Consent for publication*

Not Applicable.

*Availability of data and materials*

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

*Competing Interests*

The authors declare that they have no competing interests.

*Funding*

Not Applicable.

*Authors' contributions*

STH collected the data for this study and conducted the analysis using the Concept System® Global MAX© browser software followed by the initial drafting of the paper. KSK had the original idea for the piece of research and reworked the draft papers until final submission. Both authors read and approved the final manuscript.

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Figures
Figure 1
Cluster Point Map
Figure 2
Cluster Map

Figure 3
Impact against Duration Plot (Full page in landscape, where possible)