TOURISM, ECONOMIC GROWTH, CO₂ EMISSIONS: THE CASE OF MALAYSIA

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Abstract: *The main objective of this paper is to inspect whether is there any short run or long run causal relationship between tourism, gross domestic product (GDP) and CO2 emissions in Malaysia. The study in this field in Malaysia is in a state of paucity. This paper studied the data of three variables from 1980 to 2014. Tests performed are Granger causality test, Johansen co-integration test and Vector Error Correction Model (VECM). The result showed all three variables have unidirectional causality. Tourism affects GDP at the same time affect CO2. Due to the fact that there is the one-way causal relationship of the GDP towards CO2 emissions, the policymaker is greatly encouraged to enforce the law and regulations to minimize the negative externalities of CO2 emissions towards the climate change and environmental issues.*

*Keywords: Tourism, Economic Growth, CO₂ Emissions, Malaysia*
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Introduction

Malaysia, a parliamentary democracy system South-East Asia country has current population of 31.6 million and Gross Domestic Product (GDP) of RM1229 billion (Department of Statistics Malaysia, 2017). In 2016, World competitiveness Index ranked Malaysia as top 25th competitive out of 138 countries (World Economic Forum, 2016). More than half of the economy activities consist of service sector, it has growing number in tourist receipts, within ten years of time, and the number has double (Ministry of Tourism & Culture Malaysia, 2015). Human activities such as economy development and daily activities lead to environmental externalities over the years. It is been proven by scientific findings that, energy waste especially greenhouse gases (GHG) been omitted into the atmosphere will be trapped within and will cause a snowballing effect (Zaid, Myeda, Mahyuddin and Sulaiman, 2015). Is the any

causality effect among the discussed 3 variables: economic growth, tourism and Carbon Dioxide (CO_2)?

Malaysia receives revenue from tourism as one of the main sources of income. 14.9% of tourism and travel activities contributed to GDP in 2014 (World Travel & Tourism Council, 2015). Fig.1 shows an overall trend of tourist receipts is increasing, Malaysia observed that since 1998, there has a steep increase until 2014. Tourist from ASEAN countries are majority followed by Japan, China and China. While tourism industry sees as one of world's fastest growing industry, it has created many job opportunities. Government's policy such as the Ninth and Tenth Malaysia Plan been highly promoting tourism, aligned with that, public-private sector is in collaboration to further enhance tourism experience in Malaysia (Bhuiyan, Siwar & Ismail, 2013).
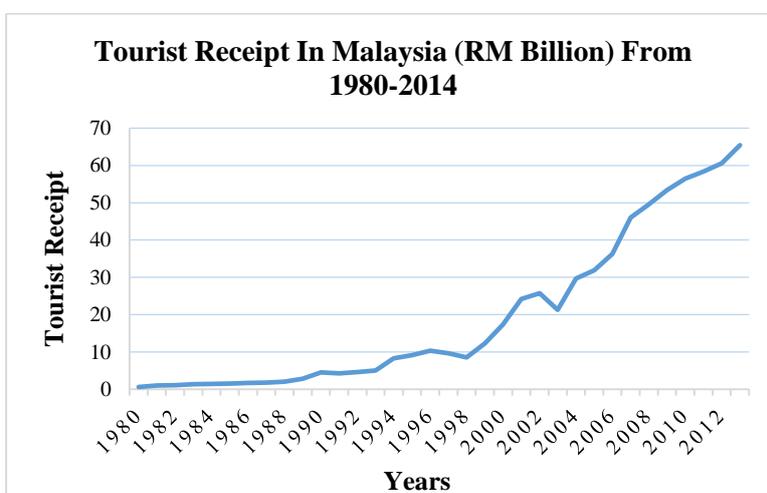
Figure 1: Line Graph of Tourist Receipt From 1980 To 2008 In Malaysia.
Source: Graph Created by Using Data from Bloomberg Database.

Graph of GDP in Malaysia from 1980-2014
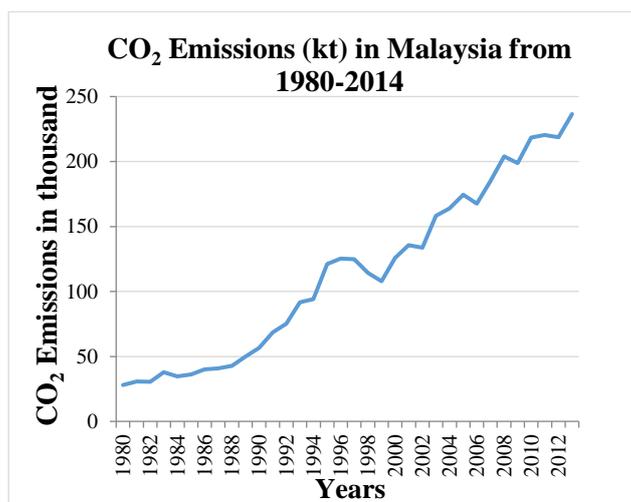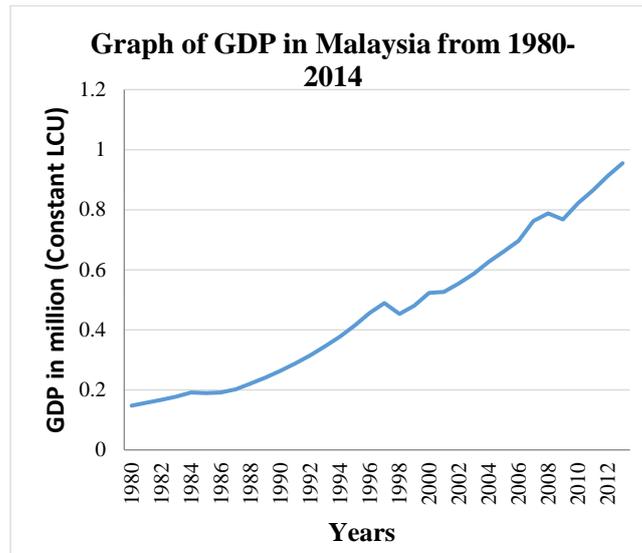
Figure 2: Line Graph of CO_2 Emissions and Gross Domestic Product in Malaysia from 1980 To 2014.

Source: Graph Created by Using Data from World Bank Database

Carbon Dioxide (CO_2) data in Fig.2 shown a steady upward trend throughout the study period, as at 2014's the emissions is around 250,000 kilo tonnes (kt). Malaysia need to carry out strategic procedures and planning in order to tackle the issue, as Malaysia is the Asia top CO_2 emitter besides Singapore and Brunei. According to Zaid et al. (2015). Malaysia is committed to reduce the CO_2 emission of 40% by 2020 and announced a voluntary commitment. CO_2 is one of the component lead to global warming. It is estimated that, tourism contributed 5% global share of CO_2 emissions with the 4.6% radioactive forcing (RF) towards global warming (UNWTO, 2008). The information signals an alarming situation as faced by environment. GDP is significant to determine a country's wealth. As shown in Fig.2 Malaysia's GDP also depicts a growing trend throughout 1980-2014. It is not until 1990s, the country's export contributed an important part towards GDP. Since 1980, industrialization in larger scale as compared before the eigthties has been established under the lead of Tun Dato' Seri Dr Mahathir Bin Mohamad (Yusoff, Hasan & Jalil, 2000). Some fluctuations can be seen from the data throughout the time series is when some few crises such as Asian Financial Crisis 1997, US Subprime Mortgage crisis and some Global financial crisis (Abidin & Raisah, 2009). On the overall, Malaysia's recovery has been healthy as it took relatively small amount of time to bounce back as compared to many other countries.

The study in this field in Malaysia is lacking, therefore this study is carried out. The process of industrialization is proved that has beneficiated towards the national development, as more production is made, yet the higher CO_2 emissions is expected to be released into the atmosphere. Will it cause the environmental externalities in the short run and long run? Tourism activities such as inbound and outbound travelling might produce environmental waste as well. GDP growth and tourism recipients show upwards movement is positive; while CO_2 emissions increasing data create negative impacts towards the nation and environment. The negative externalities could also harm the socio-economic in the country.

This paper is to examine whether is there any short run or long run causal relationship between tourism, GDP, and tourism in Malaysia from 1980 to 2014. Is there is bidirectional causality between any pairs of the variables? While Malaysia is chosen for its potentials as an emerging

economy and many significant economic development. The findings aim to provide more information to the policy maker as well as non-government organization regarding the 3 variables. It also may beneficiate to various stakeholders within this economy in the long run such as national planning as the result computed observed few decades of historical movements. Lastly, it is to raise awareness on the environmental issues to public.

Literature Review
Whether these three variables are actually having significant relationship among them either in long run or short run or in causal term, many past studies had determined the relationship among these variables but not in Malaysia.

Tourism and CO_2 Emissions
Responding to Global Challenges at 2008 estimated that tourism contributed around 5% of global share of CO_2 while around 4.6% radiative forcing (RF) of contribution towards global warming, where RF refers to the change in the atmosphere due to GHG emissions (Stockholm Environment Institute & Greenhouse Gas Management Institute, 2011). New Zealand's case of average energy use per tourist for transport was about 3990MJ (equivalent to 116 litres of petrol) and 275kg of CO_2 emissions (Becken, 2005). Zeppel and Beaumont (2012) studied impacts of climate change on Australia's tourism destinations and tourism agencies responses, stated climate change increase costs for tourism operators. The destinations will receive impacts such as natural disasters, changing of consumer travel behaviour as well as changing weather pattern. Further supported by the studies of Solarin (2014), Amzath and Zhao (2014), Al-Mulali, Fereidouni and Mohammed (2015) shown that the correlation between tourism and CO_2 emissions is positive by using DOLS model. Dogana, Sekeraand Bulbul (2015) which found that there is one-way causality between tourism and CO_2 emissions through a panel study of OECD countries from 1995-2010.

By looking at the correlation relationship, Paramati, Alam and Chen (2016) and Jebli, Youssef and Apergis (2014), they achieved a conclusion that there is no relationship between tourism and CO_2 emissions in the short run. Meanwhile, long run shows bidirectional causality. In Turkey case, by using Auto Regressive Distributed Lag (ARDL) there is a short run relationship between significant dynamic relationship between CO_2 emissions and tourist arrivals (Yorucu, 2016). However, there were also an inverse relationship found by Basarir and Cakir (2015), Leitao and Shahbaz (2015), an increase in tourism arrivals tends to decrease CO_2 emissions.

The environmental issue due to CO_2 emissions such as climate change will surely bring impact one way or another towards the tourism whether or not the country's economy mainly depends on tourism industry. The causal relationship might differ based on some variations such as the nation's establishment as well as the tourism industry nature's. On a collective term, CO_2 emissions and Tourism have a dispersed range of conclusions, but on the overall, developed economies tends to show two-way direction of correlation than developing ones of no any causal relationship.

GDP and CO_2 Emissions
Environmental Kuznets curve (EKC) is a systematic relationship between environmental quality and economic growth, by analogy with the income-inequality relationship postulated by Kuznets (Alam, 2014). EKC hypothesis provided an inverted U-shape in long run and short run relationship between CO_2 emissions and GDP. In the first regime the CO_2 emissions raises

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when the GDP raise. In second regime, when the GDP exceed threshold parameter (US\$ 4686 million), the CO_2 emissions will then drop (Saboori, Sulaiman & Mohd, 2012; Heidari, Katircioglu & Saeidpour, 2015; Govindaraju & Tang, 2013). This may due to the onset of accelerated growth path may not have paid much attention to the quality of the environment and nevertheless, after reaching a certain level of per capita income they demand for a healthy environment.

Pakistan case and Malaysia case, unidirectional causality was detected in long run relationship which GDP granger cause CO_2 emissions but no short run relationship (Ali, Khatoon, Ather & Akhtar, 2015; Saboori et al, 2012). This implies that any emissions reduction policy or investment in pollution abatement will not hurt the economic growth and could be a feasible policy tool for Malaysia to achieve its sustainable development in the long run. However, the studies of Peng, Tan, Li and Hu (2016), Ozturk and Uddin (2012), Azlina and Mustapha (2012), Bozkurt and Akan (2014) indicated that CO_2 emissions granger cause GDP. This may due to the impact from any policies that emerge the reduction of pollutant emissions will bring an impact to economic growth in Malaysia.

Meanwhile, bidirectional causality relationship between CO_2 emissions and GDP in short run was found in India, but there was not long run causality relationship detected (Govindaraju & Tang, 2013; Ghosh, 2010; Peng, Tan, Li & Hu, 2016). India using many dirty fuel to rapid their development and thus it cause greatest CO_2 emissions. GDP and CO_2 emission is expected to have unidirectional causality, we can acknowledge different selected variable and countries will having different finding, might due to their select variables or the countries' policies.

Data and Methodology

   Variable and Data Source
In order to achieve research objectives, secondary data was used where data can be quantified and measured. The data of tourist arrival receipt in this study are collected from Bloomberg (Bloomberg, 2017). It is the revenue earned by a country from inbound tourism including all receipts from the expenditure made by visitors from abroad, such as food and drinks, lodging, fuel, entertainment, transportation, shopping and etc. Data are in billion Ringgit Malaysia (RM billion). Whereas GDP and CO_2 emissions are collected from World Bank (The World Dank, 2017) in yearly basis from 1980 to 2014. GDP is the sum of gross value added by all resident producers in the economy and any product taxes, and minus any subsidies which does not include in the value of the products. It is calculated without deducting the depreciation of fabricated assets or the depletion and degradation of natural resources. Data are in constant local currency (RM). CO_2 emissions are those stemming from the burning of fossil fuels and the manufacture of cement. It also includes CO_2 produced during consumption of solid, liquid, and gas fuels and gas flaring. Data are in btonne (kt). The data then rearrange in Excel, empirical test in E-View and results interpret.

   Model Specification
To identify the relationship between tourism, CO_2 emissions and GDP, using the following equation:

$$CO2 = f\,(GDP,\ TOUR) \qquad\qquad\qquad (1)$$

This equation then convert into logarithmic form. The specification is assumed to be as in the following equation (2):

$$LCO2 = \beta_0 + \beta_1\ LTOUR_{t-1} + \beta_2\ LGDP_{t-1} + \varepsilon_t \qquad (2)$$

Where,
TOUR = Tourist Arrival Receipt (measure by tourism revenue, in RM millions)
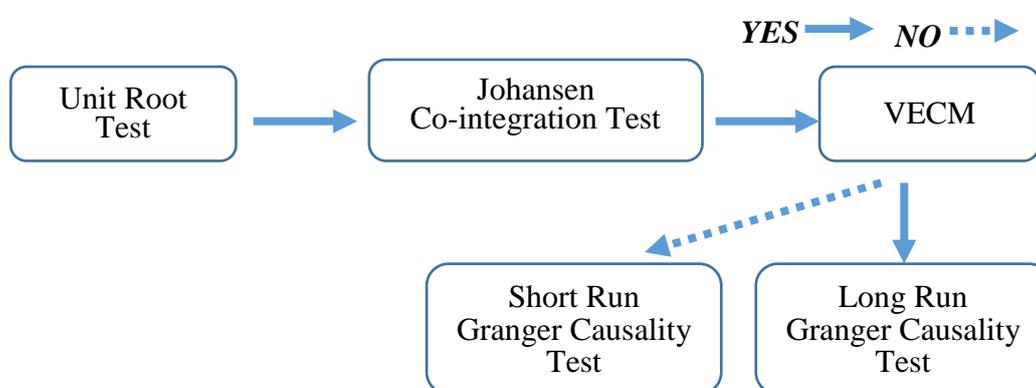GDP = Gross Domestic Product (in Constant local currency, RM)
CO2 = Carbon Dioxide (measure in Kilotonne, kt)
ε_t = Error Term
β_0 = Intercept

Methodology

Figure 3: Outline of Methodology

First, the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) unit root tests will be used to test for the stationary of variable in the model. According to Granger and Newbold (1974), a non-stationary series means that the R^2 and the t-statistics are no longer follow the usual distribution and can be wildly inflated. In other words, a non-stationary time series data will give us an unreliable and spurious result which will lead to a poor forecasting. Follow by trace Statistics and Maximum Eigenvalue Johansen Co-integration test to figure out the long run relationship among variables. There is a strict assumption where the chosen variables must be non-stationary and unit root (Hjalmarsson & Osterholm, 2007). Furthermore, variables in the equation must be in same order of integration. Then find out the optimal lag length by using Vector Error Correction Model (VECM). The concept of co-integration via Granger (1981) and Engle and Granger (1987) that if the 2 integrated variables possessed a similar stochastic trend and variables are stationary, then it can be concluding that there is co-integration. Lastly, Granger causality test are conducted to show the causality relationship among these three variables.

Data Analysis
Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests which under unit root test are applied to check the stationary level of all variables chosen. Johansen methodology is to find out the co-integrating relationship among the variables through trace test and maximum

eigenvalue. Lastly continued by applied VECM and Granger Causality test to define the causal relationship between the variables.

Unit Root Test

Table 1: Stationary of Variables in the ADF and PP Unit Root Test

	Augmented Dickey Fuller (ADF)		Philips Perron (PP)	
	Level	First Difference	Level	First Difference
CO2	-1.3899	-6.2527**	-1.4203	-6.2245**
GDP	-1.1871	-4.6085**	-1.3613	-4.6221**
Tourism	-2.6059	-5.6174**	-2.5738	-8.1841**

Note: ** represent significance level of 5%.

According to Table 1, the results of ADF test show that all variables are non-stationary at level form with intercept and trend. While after the first differencing with intercept, all variables is stationary at 5% significance level. Table 1 also shows the results of stationarity of all variables in PP unit root test in 5% significance level. ADF and PP test show a consistent unit root results.

The Johansen Methodology

Table 2: Johansen-Juselius Cointegration Test

Hypothesized No. Of CE(s)	Trace Statistic	Max-Eigen Statistic	Critical Values (5%)	
			Trace	Max-Eigen
r=0	30.7277**	21.6448**	29.7971	21.1316
r≤1	9.1128	8.2345	15.4947	14.2646

Noted: r represents the number of co-integrating vectors.

Based on Table 2, the result shows the vector of co-integration equals to 1 (r = 1) which indicates that there is presence of co-integrating relationships among the variables. The tourism, GDP, and CO_2 emissions are moving together in the long run.

Vector Error Correction Model (VECM)
The optimum lag length chosen is 4 under rules of thumb. The long run equation of VECM has been predicted as below.

Long Run Model Specification

$$LCO2 = -33.9765 - 0.2192\ LTOUR** + 1.7186GDP** \qquad (3)$$
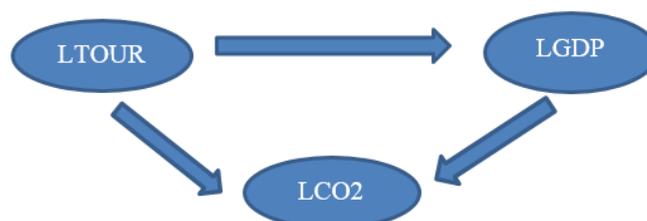
Where,
LCO2 = Natural log of CO_2 emissions in Malaysia (Kilotonne)
LTOUR = Natural log of tourism in Malaysia (RM billion)
LGDP = Natural log of GDP in Malaysia (RM billion)
Note: The lag length of variables in the VECM is based on the rules of thumb.

The Granger Causality Test

Figure 4: Granger Causality

Note: The arrows denote the direction of granger causality, as LTOUR granger causes LGDP, LGDP granger causes LCO2, and LTOUR granger causes LCO2.

Based on the equation (3), tourism and GDP are significantly affect the CO2 emissions in the long run at 5% significance level. As a summary on Fig 4, CO_2 emissions are influences by tourism and GDP and they are significantly influences towards CO_2 emissions. This result is same as Basarir and Cakir (2015), and Leitao and Shahbaz (2015). Both journals are included the relationship test between tourism arrivals and CO_2 emissions by applied panel data. According to Strizzi and Meis (2001), under the case of LAC region, there are many factors that determining the inbound and outbound travel into a country which can be classify as political, social, and economic. In addition, higher sea levels, changes in temperature, biodiversity of oceanic lives may be harmed, eventually raise the CO_2 emissions in the region. Furthermore, the GDP granger causes CO_2 emissions is supported by Govindaraju and Tang (2013). Researchers concluded that the unidirectional only happen in India, this is because the degradation of environment affected the process of economic growth and in India. However, Ghosh (2010) stated this might due to the IEP document published by Government of India, increase the primary supply of India by at least 3 to 4 times in order to make energy prices affordable. Hence, it cause greatest CO_2 emissions influences.

Conclusion and Policy Recommendations

The objective of the study is achieved. Johansen co-integration test shown there is co-integration of the three variables. There is a long run relationship. While the short run relationship performed via Granger causality test indicated there is a one-way direction between tourism and GDP, Tourism towards CO_2 emissions, and GDP causal affects the CO_2 emissions.

Based on the results, policymakers are suggested to focus on tourism investment to boost the GDP. Besides, tourism investment should focus more on poverty area. Since tourism is a major contributor to the employment creation, by focusing tourism investment on poverty area could benefit the poorer groups through employment of local people in tourism enterprises and thus reduces the poverty level. On the other hand, the policy maker is profoundly suggested to promote a green economy, to revise and review current law and regulations in the nation that satisfy the international standard on environmental issues related enforcements. Both supply and demand side in the economy to promote green economy planning and products.

One of the limitations of this study is that the study is only based on the data and situation in Malaysia, other countries might not find this paper useful or relevant to their own as there are

many varying factors to determine. So, panel data is recommended for future study by including the data of several countries.

References

Abidin, M. Z., & Rasiah, R. (2009). *The global financial crisis and the Malaysian economy: Impact and responses*. Kuala Lumpur: United Nations Development Programme.

Ali, A., Khatoon, S., Ather, M., & Akhtar, N. (2015). Modeling energy consumption, carbon emission and economic growth: Empirical analysis for Pakistan. *International Journal of Energy Economics and Policy*, *5*(2), 624-630.

Azlina, A., & Mustapha, N. N. (2012). Energy, economic growth and pollutant emissions nexus: The case of Malaysia. *Social and Behavioral Sciences*, *65*(3), 1-7.

Basarir, C., & Cakir, Y. N. (2015). Causal interactions between CO2 emissions, financial development, energy and tourism. *Asian Economic and Financial Review*, *5*(11), 1227-1238.

Bhuiyan, M. A., Siwar, C., & Ismail, S. M. (2013). Tourism development in Malaysia from the perspective of development plans. *Asian Social Science, 9*(9), 11-18.

Bloomberg. (2017). Retrieved May 22, 2017, from https://www.bloomberg.com/asia

Bozkurt, C., Akan, Y. (2014). Economic growth, CO_2 emissions and energy consumption: the Turkish case. *International Journal of Energy Econ Policy, 4*(3), 484–494.

Department of Statistics Malaysia. (2017). *Population quick information: Population by age and ethnic group, Malaysia, 2016.Retrieved* from http://pqi.stats.gov.my/result.php?token=2be042e00ec841581beeba7c00686f32

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica*, *55*(2), 251-276.

Ghosh, S. (2010). Examining carbon emissions economic growth nexus for India: A multivariate cointegration approach. *Energy Policy*, *38*(6), 3008-3014.

Govindaraju, C., & Tang, C. F. (2013). The dynamic links between CO_2 emissions, economic growth and coal consumption in China and India. *Applied Energy*, *104*, 310-318.

Granger, C., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of Econometrics*, *2*(2), 111-120.

Granger, C. W. J. (1981). Some properties of time series data and their use in econometric model specification. *Journal of Econometrics*, *16*(1), 121-130.

Hjalmarsson, E., & Osterholm, P. (2007). Testing for cointegration using the Johansen methodology when variables are near –integrated. IMF Working Paper No. 07/141; FRB International Finance Discussion Paper No. 915. Retrieved from SSRN: https://ssrn.com/abstract=1007890

Leitao, N. C., & Shahbaz, M. (2015). Economic growth, tourism arrivals and climate Change (ERC Working Paper No. 004). Retrieved from Energy Research Centre website: http://www.ciitlahore.edu.pk/erc/ERCWP/ERC-WP-4.pdf

Ministry of Tourism & Culture Malaysia. (2015). *Malaysia tourism in brief: Facts and figures overview*. Retrieved May 22, 2017, from http://www.tourism.gov.my/statistics

Ozturk, I., & Uddin, G. S. (2012). Causality among carbon emissions, energy consumption and growth in India. *Economic Research-Ekonomska Istraživanja*, *25*(3), 752-775.

Peng, H., Tan, X., Li, Y., & Hu, L. (2016). Economic growth, foreign direct investment and CO_2 Emissions in China: a panel granger causality analysis. *Sustainability*, *8*(3), 233.

Saboori, B., Sulaiman, J., & Mohd, S. (2012). Economic growth and CO_2 emissions in Malaysia: A cointegration analysis of the Environmental Kuznets Curve. *Energy Policy*, *51*, 184-191.

Strizzi, N., & Meis, S. (2001). Challenges facing tourism markets in Latin America and the Caribbean region in the new millennium. *Journal of Travel Research, 40*(2), 183-192.

The World Bank. (2017). *World Bank Open Data*. Retrieved May 22, 2017.

United Nations World Tourism Organization (UNWTO). (2008). *Climate change and tourism: Responding to global challenges*. Madrid: World Tourism Organization.

World Economic Forum (2016). *The Global Competitiveness Report 2016-2017*. Retrieved May 22, 2017, from http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobalCompetitivenessReport2016-2017_FINAL.pdf

World Travel & Tourism Council. (2015). Travel & tourism economic impact 2015 Malaysia. *The Authority on World Travel & Tourism*, 1-24.

Yusof, Z. A., & Bhattasali, D. (2008). *Economic growth and development in Malaysia: Policy making and leadership*. Washington: The World Bank.

Zaid, S. M., Myeda, N. E., Mahyuddin, N., & Sulaiman, R. (2015). Malaysia's rising GHG emissions and carbon 'lock-in' risk: A review of Malaysian building sector legislation and policy. *Journal of Surveying, Construction and Property (JSCP)*, *6*(1), 1-13.