The Role of Renewable Energy, Public Health Expenditure, Logistics and Environmental Performance in Economic Growth: An Evidence from Structural Equation Modelling

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Abstract:

We do this research to investigate the relationship between renewable energy, public health expenditure, logistics performance indices, and economic and environmental sustainability in the ASEAN member states, through the analysis of a panel data from 2007 to 2017. The study used secondary data, which is downloaded from the World Bank Website and employs SEM (Structural Equation Modelling) model for testing hypothesis. The results show that the usage of renewable energy in logistical operations would enhance the environmental and economic performance in terms of mitigating carbon emissions and greenhouse gas emissions. While, public health expenditure and environmental performance is negatively correlated, which confirms that greater environmental sustainability with lower carbon emissions and greenhouse gases will improve human health and economic growth. Moreover, greater public health expenditure and poor environmental performance has negative effect on economic growth, inefficiency and low productivity of labor slowdown to the economic activities. For another side, the usage of renewable energy and the adoption of green practices in international logistics will develop the environmental sustainability, establish better image of a country and attract foreign direct investment inflows, and also minimize carbon emissions and public health expenditure, spurring sustainable economic growth with better export opportunities in pro-environmental countries.

Keywords: Renewable energy; Economic growth; Public health expenditure; Carbon emissions; FDI inflows; Green logistics

1. Introduction

In logistics management literature, the association between renewable energy, logistics infrastructure, environmental performance indicators and economic growth factors has been deeply explored, but, there still exists a gap to be critically discussed on empirical evaluation of renewable energy, environmental and economic factors so as to assess the best practices of green logistics and supply chain management across the globe. Logistics is one of the important backbones for global supply chain management. In fact, logistics management is a series of integrated actions that improve material handling, information processing, storage of inventory, and freight transport that is required to move goods through smooth process of supply chain (Khan et al., 2018). In 1990s, logisticians were widely aware of the idea of GSCM (green supply chain management). The bottom line of GSCM is to reduce negative effects from logistics operations and to protect environmental sustainability with greater economic growth (Martel and Klibi, 2016). Undeniably, logistics operations mainly rely on energy consumptions, especially fossil fuel, which emits heavy carbon emissions and also creates negative effect on environmental sustainability. Rao and Holt (2005) conducted an empirical research to examine 'GSCM' in relation with the environmental and economic factors in a sample of Asian countries and its finding showed that green practices in supply chain management significantly lead towards economic growth. Khan et al., (2017) highlighted that logistics operations are the most polluted activities in the global supply chain management, which can destroy environmental beauty and create climate change problems in region. Besassi et al. (2015) investigated the association between logistics performance and transport infrastructure in Spanish regions. The results showed that smooth and superior quality logistics infrastructure would reduce the air pollution and enhance the environmental sustainability with greater economic activities including export flows, industry value added activities, and manufacturing value added activities (Aldakhil et al. 2018).

Zaman and Shamsuddin (2017) investigated practices of GSCM in different logistics activities to find out the country's economic indicators that are widely influenced by energy demand, environmental degradations and economic growth through analyzing the data during 2007 to 2014 in a panel of developed countries. They found that international shipments increase fossil emissions due to long lead-time between suppliers' country and importers' country, which also deteriorates the environmental beauty/climate. The findings concluded that it is essential for a country to realize that logistics operations should be well-connected with country's national sustainable development agenda, because of its better wealthy and healthy environment. United Nation (2014) indicated several unbelievable facts under transportation, i.e., which were shown in approximately from 22% to 25% of CO2 emissions generating highly negative environment relevant problems for human life, which causes many diseases such as lung cancer, ischemic heart, and asthma. Hutchins and Sutherland (2008) highlighted green practices are necessary for global supply chain and logistics operations which will reduce environmental and human risks.

A number of firms use green techniques and procedures as a strategy to enhance economic and environmental performance, i.e., eco-efficient firms use renewable energy resources, recycling, and reduce carbon footprints. Apparently, many developing countries have started to adopt green techniques in their business and logistics operations. Khan and Dong (2017) conducted an empirical research to examine the impact of green practices in supply chain on organizational performance, they found that Pakistani manufacturers are eager to adopt green practices including green purchasing, green transportation, green manufacturing, and green warehousing. In fact, a number of manufacturing firms have already adopted partial green practices on supply chain operations to improve firms' financial and environmental performance with greater customer satisfaction and to build positive image for firms. In similar line, an empirical research was conducted in China and the findings concluded that Chinese firms continued struggling to enhance their image through adopting green lopgistics practices and many firms shifted their manufacturing and logistics operations into relying on renewable energy/biofuels Zhu et al. (2008). On the other side, Dangelico & Pontrandolfo (2013) their study's results showed that both environmental performance and economic performance and firm image are not positively correlated with an increasing level of carbon emissions.

This study has six sections. The first section covers introduction part of study. Section two is based on literature review related with renewable energy and logistics indicators attempt to find its link with country's environmental and economic performance. The third section includes data source and methodology. Section four covers analysis part of research and discussion with previous published materials and/or research papers. Section five provides concluding remarks and the last section provides research implications/policies and future research work guidance.

Literature Review and Hypothesis Formulation

Since last couple of decades, environmental friendly logistics has been a very hot topic in supply chain management around the globe. It is no doubt that governmental strict policies and customers create pressure on firms so that they would adopt green processes and activities in global logistics operations to maintain environmental beauty. We have provided the in-depth literature reviews in the following sub-sections to clear the linkage between green logistic and national scale economic and environmental indicators.

2.1. Green Energy Sources

Logistics management act as an integral part in global supply chain management, and logistics operations mainly depend on fossil fuel consumptions which pollute the environmental sustainability and also damage the human lives. Khan et al. (2018) discussed GSCM practices in different logistics activities to develop the national scale factors that influence country's energy demand, environmental sustainability and economic growth in a panel of 43 countries. They concluded that global logistics operations act as a major generator of carbon emissions and greenhouse gases, while the usage of biofuels and green energy can mitigate the negative effects of logistics operations. It can be seen from the results that renewable energy improves the environmental beauty and economic health in terms of greater export opportunities in developed countries, where environmental policies are strict as compare to developing countries. Nassani et al. (2017) did an empirical research BRICS countries to evaluate Environmental Kuznets Curve for different air pollutants under the influence of such economic indicators as, energy demand, transportation services, economic and financial development. The findings demonstrated the inverted U-shaped association between nitrous oxide emissions and financial development and U-shaped association between greenhouse gas

emissions and economic development. They concluded that between fossil emissions and transportation services, there is a strong positive correlation that deteriorate the sustainable agenda of BRICS countries. They also suggest that policies should be determined to help minimize and/or control the environmental degradations through adopting green energy and green vehicles in logistics operations.

Firms adopt green procedures and processes as a strategic tool to enhance financial performance i.e., recycling techniques and biofuels which will generate lower costs and no/little harm to environmental beauty. Unquestionably, governments and corporate sectors are realizing the significance of renewable energy sources and green techniques for better economic environmental growth. Zhu et al. (2008) evaluated the business practices of Chinese firms and found that Chinese companies are fully cooperating with governmental sustainability agenda. In addition, a number of firms converted their polluted systems towards eco-efficient systems, which not only benefits firms in terms of positive image building but also encourages customers to "go-towards green and buy green products". Shahbaz et al. (2015) argued that energy efficiency increases economic growth with the presence of capital and labor, while Bhattacharya et al. (2016) claimed that renewable energy is a promising support for green financial growth which may be executed with the help of governmental bodies to develop and apply green techniques, procedures and technologies in the business activities. Khan and Dong (2017) measured the green practices in manufacturing firms of Pakistan. The findings indicated that ecological design of products, cooperation with customers and green information systems positively and significantly enhance the firms' performance, while green purchasing is negatively correlated with financial performance of firms and they conclude that due to scarcity of green suppliers in Pakistan, most firms import green materials from European and Western countries, which incurs huge costs in supply chain systems. Lee & Wu (2014) suggested that vehicles' fuels used in global logistics should be substituted with renewable energy/biofuels sources so as to reduce world temperature, climate change, global warming besides better environmental sustainability. Qureshi et al. (2016) evaluated the association between logistics operations, energy demands and national scale economic factors. The findings showed the strong relationship between energy demand, economic indicators and logistics operations in the developed countries across the globe. Dangelico & Pontrandolfo (2013) conducted a research on green processes and firm performance. The results show that firms' financial performance is not positively correlated with polluted vehicles. They suggests that firms should adopt renewable energy/biofuels in their logistical systems to improve their environmental and economic performance with greater chances to export in European and Western countries. Khan et al. (2017a) measured the sample of developed countries to investigate the correlation between logistics and environmental indicators. They confirmed that the quality infrastructure of logistics enhances the economic health via resource depletion and application of green vehicles significantly reduce the environmental degradations. The policy to environmental factors and converse natural resources is vital to encourage sustainability agenda. Based on above cited papers, we come up with the following hypothesis:

H1a: Renewable Energy usage in Logistical operations promotes Green Logistics

H1b: Renewable Energy usage enhance the environmental performance

H1c: Renewable Energy have strong and positive relationship with Economic Health

H1d: Renewable Energy Consumptions has negative relationship with Health Expenditure

2.2. The Relationship between Logistics Indicators, National Scale Environmental and Economic Factors

Logistics industry plays a key part in country's economics and provides export opportunities to the firms. While, polluted logistics system is not only degraded and creates barriers for the firms in terms of export restriction in European and Western countries but it is also harmful to the environmental sustainability. European Commission, (2011) the report emphasized that the labors working in logistics and freight industry are beyond 10 million, which is almost 5% of total employment. The industry is purely dependent on fossil fuel and consumes around 96% of its energy necessities. Hence, during the period of 1990 to 2008, logistics industry contribution in greenhouse gas emissions is nearly 35%. To evaluate the relationship between logistics indicators, economic growth, and environmental performance in a panel of 43 different countries around the globe, Khan et al., (2018)did an empirical research through using the data from 2007 to 2016. The results demonstrated that improved logistics indicators have

positive impacts on country's economic factors including manufacturing value added % of GDP, FDI (foreign direct investment inflows) and trade openness. In addition, poor logistics infrastructure is a major cause of carbon emissions and poor economic growth. They concluded that logistics industry have potential to increase and/or decrease the overall economic and environmental performance of the countries. Because polluted logistics system become a trade barrier for a number of countries in different level, which restrict trade and export opportunities. For another side, green logistics infrastructure and vehicles enhance the environmental sustainability and also attract the foreign investments with better export opportunities around the globe. They suggested that government should encourage green vehicles and green practices in logistical operations for better economic and environmental growth.

There is no doubt that regulatory authorities and customers are creating pressure to let firms think over environmental sustainability. In fact, governments' strict policies are persuading corporate sector to implement green practices in their business operations, which reflects governments' concern on environmental degradations (Alinejad et al. 2018; Luthra, Garg, & Haleem, 2015). Meanwhile, the shortage of research on how to integrate supply chain model with environmental sustainability agenda makes this task more thought-provoking. Aldakhil et al. (2018) identified the key determinants of supply chain for green business growth, influencing economic, environmental and social factors for developed countries, by using a panel data from 1995 to 2015. Its findings revealed that green logistics indicators spur the country's per capita income and attract the FDI inflows. While, logistics operations mainly rely on fossil fuel, which needs to be shifted towards renewable energy/biofuels for environmental beauty. The study also suggested the need of an integrated supply chain model to provoke 'go-for-green' business and support environmental sustainability agenda.

The solution of fauna and flora issues lies in the application of biofuels and the adoption of green practices in logistical operations. The logistics industry emits carbon emissions and PM 2.5 (fine particulate matter), which directly affects environmental degradation and human lives. Khan et al. (2018) and Khan and Dong (2017) it is industrialization that creates climate change and global warming as a key role, but at the same time, green technology has capability to mitigate the negative effects of logistics and business operations. Ojala et al. (2013) conducted a study in Finland and found that for green products, consumers are willing to pay higher prices, which also motivates firms to adopt greener processes and ecological design in their products. Laari, Töyli, & Ojala, (2017) by 2025 due to strict governmental policies and customer awareness, green logistics services will grow in the Baltic Sea Region, (Uygun & Dede, 2016) and more than 70% firms in Finland have adopted green practices in their business and logistical operations. Savita et al. (2012) claimed that green technology would offset the carbon foot prints as much as 15% by the end of 2020. They also emphasized that solving environmental issues is not only the responsibility of governmental authorities, but they should be resolved with the collective efforts of governmental bodies, corporate sectors, customer awareness and policy makers' formation of more effective environmental policies. Therefore, we initiated the following hypothesis:

H2a: Green Logistics has positive and significant correlation with Economic Development

H2b: Green Logistics mitigate the harmful effects of logistical operations and enhance the Environmental sustainability

2.3. The Relationship between Environmental, Economic and Health Performance

Countries environmental performance reduces the health expenditure and enhances the economic activities and besides attracts the foreign investors and improves country image in international arena. Hamelinck et al. (2005) argued that the industrialization and polluted logistics operations lifted environmental problems, which can be mitigated through the adoption of green practices and implementing strict environmental policies by regulatory authorities. Khan et al. (2017a) conducted a study in the context of Pakistan by using the sample of 218 manufacturing firms and the findings revealed that environmental performance of firms are directly and positively correlated with firm financial performance and provide opportunity to build competitive edge. Charfeddine, (2017) conducted an empirical research in Qatar and results confirmed that poor environmental performance is positively correlated with health expenditure and due to the air and water pollution, human lives are at risk and people are facing different diseases including Asthma, Lungs Cancer and Heart Problems. Bekhet & Othman, (2018) highlighted that rapid global polluted logistics operations result in a 1.4% increment in carbon emissions, which

does harm to both environmental sustainability and human health and fauna and flora. Zoudi, (2016) In the Asian world, if no appropriate environmental policy is adopted by governmental authority, climate change will reduce annual GDP growth as much as 2% to 4% till the end of 2040. Khan et al. (2018) emphasized that as clean alternative to fossil fuels, the usage of green energy/biofuels are promoted can be promoted. The key advantages of biofuels are the low cost as compare to fossil fuels and to mitigate the horrible effect of climate change and carbon emissions (Zawaydeh, 2017).

Countries' environmental problems are positively correlated with health expenditure, namely, discouraging foreign investors and generating adversity effects on people's health with different diseases including brain, lungs cancer and breathing diseases. Khan et al. (2018); Zaman and Shamsuddin, (2017) confirmed that logistics operations at the price of damaging the environmental sustainability would compromise people's health. Wu & Dunn (1995) air pollution has serious effects on people's living and has harmful impact on fauna and flora. On the other hand, due to poor environmental performance of country, foreign investors avoid bringing their investments and domestic firms have limited opportunities to export their goods into international market, which also slows down the economic activities. Bekhet & Othman, (2018) and Khan et al. (2016) emphasized governmental bodies have started to motivate firms through strict environmental policies and monetary benefits with tax exemptions on green products and vehicles. Boukheroub et al. (2015) companies reduce their negative effects of logistical operations through adopting green practices, which enhances the economic and environmental performance and provides opportunities to explore new markets in developed countries. Based on above cited papers, we put forward the following hypothesis:

Hc1: Greater environmental performance reduces the health expenditure

Hc2: Country environmental performance has positive correlation with Economic growth

2.4. The Association between Health Expenditure and Economic Growth

Undeniably, industrialization creates several environmental problems, which also increase health expenditure of countries. Health is a significant factor of healthy economic growth; a healthy population will generate greater productivity and higher income per capita. The role of human health cannot be ignored in better economic development. Khan et al. (2017a) conducted a study on panel of 43 developed countries to find out the effect of industrialization on human lives and countries' health expenditure. The results revealed that human health is significantly compromised due to polluted economic growth and poor environmental performance. Bloom and Canning, (2000) argued that, when a country's labor is healthy, they are able to develop skills and activity that can contribute to economic growth. While, labor with poor health have an adverse effect on productivity (Cole, 2006; Piabuo & Tieguhong, 2017). According to the report of World Health Organization, (2017) developed countries' economic growth is sustainable as compare to developing countries due to low health expenditure and (World Health Organization, 2005) more than 50% difference in economic development between developed and developing countries is because of poor health of workers. Piabuo & Tieguhong, (2017) conducted a research to examine the association between health expenditure and economic performance in African countries. The results revealed that there is a negative correlation between health expenditure and economic growth in some African countries.

The association between economic development and health expenditure has been widely discussed in literature reviews in the context of African and European countries, but the results were inconclusive and researchers suggested to conduct more studies. Hashmati, (2001) used the sample of OECD (Organization for Economic Co-operation and Development) countries to evaluate the association between public health expenditure and country' economic development. The results showed the positive relationship between public health expenditure and economic development. Kar and Taban, (2003) conducted a research in Turkey and had noticed a negative association between public health expenditure and economic development. In similar line, Yumuşak and Yıldırım, (2009) with time series data of Turkey during the period of 1980 to 2005, they confirmed the negative association between health expenditure and economic growth. An empirical research conducted by Oni, (2014) she explained that a country's total health expenditure, labor force productivity, and gross capital formation are significant indicators of the country's economic development in the context of Nigeria but poor health of workers and life expectancy rate are negatively affected on economic growth. Eggoh et al. (2015) and Hilaire and Gilles, (2015)

investigated the impact of health expenditure on country' economic growth. In their findings, we learned greater health expenditure and poor labor health not only slow down the economic activities but also increase unemployment rate and create burden on country economic growth for a long term. Khan et al. (2017a) usually health expenditure of countries is increased due to the poor environmental performance in terms of greater CO2, GHG emissions and non-green industrialization, which can be controlled through usage of biofuels and adoption of green practices in business operations (Khan et al. 2018). On the basis of above mentioned citations, we initiate the given below hypothesis:

H4: Greater public health expenditure slowdown to the Economic Development of countries

Methodology

In this research, we draw the connection between renewable energy, logistics indicators, public health expenditure, and national scale economic and environmental determinants in a panel of ASEAN (Association of Southeast Asian Nations) countries. Unquestionably, global logistical operations is a significant tool to improved economic growth but polluted logistical operations also increase health expenditure and environmental concern are highly affected by logistical operations in the absence of renewable energy/biofuels usage business activities and lack of appropriate environmental policies. For that reason, this study creates connection between logistics indicators, public health expenditure, renewable energy, and economic and environmental determinants, which motivate green logistics practices across the ASEAN countries (Appendix Table 5 shows the list of ASEAN member states). The given below Fig.1 shows the research model and hypothesis linkage.
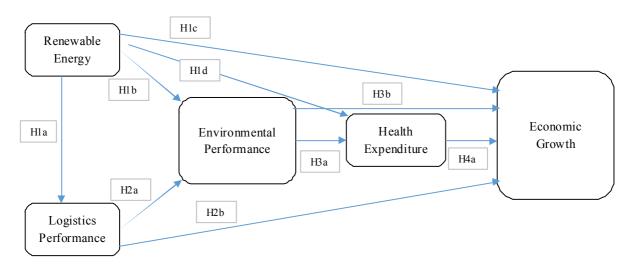

Figure 1: Research Model

For this empirical research, we have used the data of World Bank Indicators (World Bank Database, 2017). 10 member states of ASEAN were considered for analysis (See Appendix Table 5). A defined set of observed variables was used on empirical analysis in most published research papers' discussion in literature review. But, when it comes to multi-facet, scarcely direct measurable issues like environmental performance, logistics performance and economic growth, the essence to develop latent constructs using multiple observed indicators becomes appropriate. So, we set a series of latent variables comprising multiple observed indicators, which are also used as encouragement to adopt SEM (structural equation modelling) method for analysis purpose. According to Kline, (2005) and Munim and Schramm, (2018) structural equation modelling is suitable with minimum 100 sample size. For this purpose, we have pooled the data from seven years (namely 2007, 2009, 2010, 2012, 2014, 2016, and 2017),

generating 541 observations, except for observations with missing values. The definition of constructs is explained in Table 1.

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Table 1: Definition of Constructs

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Variables	Abbreviations	Definitions
Renewable Energy	REC	REC is the consumption of renewable energy (% of total final energy consumption) and it is used and prompted by government so as to maintaining environmental sustainability.
Logistics Performance	LP	LP is the logistics performance, which has been measured by the efficiency of customs clearance process in order to reduce carbon emissions, competence and quality of logistics services, and quality of trade and transport-related infrastructure to reduce carbon emissions and air pollutions as minimum as possible.
Environmental Performance	ENPI	ENPI show the environmental performance, which reflect to the better environmental sustainability. Environmental performance improvement means reduction in carbon emissions and greenhouse gases.
Health Performance	HP	The greater environmental performance improved to the people health due to fresh atmosphere with minimum carbon emission and greenhouse gases. This variable used "Health expenditure per capita (HEPC) in current US\$" as a proxy.
Economic Growth	ECO	Economy growth measured by TOP (trade openness) and FDI (foreign direct investment) inflows. These are the leading proxies used for measuring economic health.

Results and Discussions

First of all, with the Shapiro-Wilk test, normality of latent variables has been analyzed and none of the variables are normally distributed. The Satorra-Bentler rescaling technique has been adopted for estimating structural equation modelling (Munim and Scramm, 2018; Rosseel, 2012). Table 2 displays that all variables have positive mean and standard deviation. Meanwhile they have a significant peak of the distribution, indicating high logistics performance such like high efficiency of customs clearance process to reduce carbon emissions, competence and quality of logistics services, and quality of trade and transport relevant infrastructure. The logistics performance index values from 5 to 1, show high logistics performance to low logistics performance, with the panel of ASEAN member states that improve the foreign direct investment inflows and trade openness. On the other hand, environmental beauty and human health are significantly compromised by greater CO_2 (carbon emissions) in metric tons per capita and GHG (greenhouse gases) in metric tons per capita, which could be mitigated and reduced by the use of REC (renewable energy consumption). Besides, the greater usage of green energy in logistical and business operations may decrease (HP) public health expenditure and improve the labor productivity and environmental sustainability, which directly and/or indirectly promotes the economic growth of ASEAN countries.

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Table 2: Descriptive Statistics

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Variables	Mean	S.D.	Min	Max	Shapiro-Wilk test
TOP	67.090	42.71050	24.054	202.00	0.98**
FDI	2.0895	2.684120	-0.0998	18.300	0.98**
REC	51.246	26.15420	3.2624	94.175	0.96***

HP	5.1325	2.120550	2.4600	14.140	0.97***
LPIQLS	2.3015	0.354552	1.3000	3.1914	0.97***
LPICPS	2.2825	0.445150	1.1000	3.3341	0.99*
LPIQTTI	2.4921	0.391125	1.2200	3.3742	0.98**
LPICUSTOMS	2.4723	0.415215	1.2400	3.3914	0.99*
CO2	0.7948	0.660415	0.0321	2.7003	0.97***
TGHG	425454	827415.9	1468.6	2798058	0.98**

* P < 0.05; ** P < 0.01; *** P < 0.001

According to Koufteros, (1999) squared multiple correlations (SMC), standardized factor loadings, and for an acceptable measurement model, model fit indices are deliberated to be an important statistical criteria. In table 3, we have summarized the criteria of measurement model. R^2 shows the squared multiple correlations and all other values are above the recommended value of 0.50 (Munim and Scramm, 2018; Lu et al. 2007; Bollen, 1989). Furthermore, all standardized factor loadings are beyond the suggested value 0.70. TLI (Tucker Lewis Index) and CFI (Comparative Fit Index), which shows good measurement model fit, are beyond the recommended value 0.90.

Table 3: Measurement Model Results

Latent Construct	Observed Indicators	Standardized factor loading	Unstandardized factor loadings	Z-value	R2 (item realiability)
REC	REC	0.23	1.00***	24.61	1.00
LP	LPIQLS	0.16	0.92***	24.63	0.87
	LPICPS	0.18	0.97***	29.74	0.95
	LPIQTTI	0.15	0.85***	18.51	0.76
	LPICUSTOMS	0.21	0.98***	30.12	0.89
ENPI	CO2	0.17	0.97***	28.95	0.86
	TGHG	0.22	0.97***	28.21	0.87
HP	HP	1.46	0.98***	20.28	0.95
ECO	FDI	0.85	0.87***	19.23	0.79
	TOP	0.82	0.88***	18.29	0.83

Model-fit: X2 (31)=81.93, CFI = 0.98, TLI = 0.97, RMSEA = 0.09, SRMR = 0.02

*p<0.05, **p<0.01, ***p<0.001

We have also calculated the accountability of the latent variables, and the two values exceed the required level of 0.70 as recommended by Nunnally (1978). In addition, accordingly, Garver and Mentzer, (1999) also shows internal consistency of the latent variables. For testing convergent validity, we have investigated the statistical significance of the factor loadings through their z-values (Dunn et al. 1994). As per the general rule, acceptable estimates should have z-values less than -2 and or higher than + 2 (hair et al. 2006). As shown in Table 3, all indicators' z-values fulfill the criteria, which confirms that all indicators measure their respective latent construct, and endorse convergent validity of each construct with uni-dimensionality (Munim and Scramm, 2018; Anderson and Gerbing, 1988). In addition, item reliability is also confirmed, due to all R^2 values above the cutoff value 0.50. To evaluate discriminant validity, CFA analysis were conducted and non-constrained confirmatory factor analysis of one pair of constructs was compared with an over non-significant ones (Aderson and Gerbing, 1988). The results of chi-square different tests were statistically significant, which confirmed the discriminant validity of constructs.
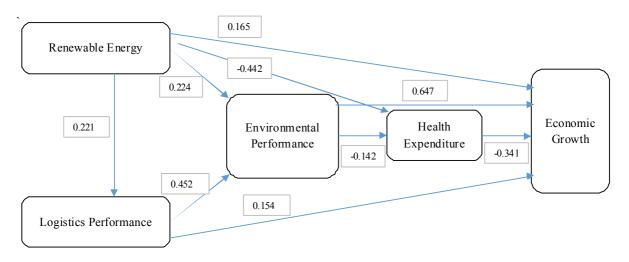
Figure 2: Structural Equation Model with Regression Coefficients

After the reliability test and measurement model have confirmed reliability and validity of constructs, we have proceeded structural equation model. Figure 2 showed the regression coefficients with their own paths. All 10 factors loadings are above the minimum cutoff level 0.70 and they are found statistically significant. The SEM has a good fit with chi-square (X2) of 72.85, and ratio of X2 and degrees of freedom (that is, 72.85/32 = 2.28 < 3) is within the range recommended (Bollen and Long, 1993). The AGFI (Adjusted Goodness of Fit Index) is 0.99, which confirms that the estimated model predicted 99% of the variances in the observed dataset. Besides, the remaining fit index measures, such as TLI (Tucker Lewis Index) and CFI (Comparative Fit Index) values are 0.97 and 0.98 respectively, beyond the minimum cutoff range. Lastly, the RMSEA and SRMR values are 0.08 and 0.02, which indicates a good fit of the structural equation modelling.

Table 4: Results of Structural Equation Modelling

Hypothesis	SEM Regression Path	Standardized Coeffient	P-value	Remarks
H1a	REC → LP	0.221	0.000	Supported
H1b	REC → ENPI	0.224	0.002	Supported
H1c	REC → ECO	0.165	0.000	Supported
H1d	REC → HP	-0.442	0.004	Supported
H2a	LP → ENPI	0.452	0.011	Supported
H2b	LP → ECO	0.154	0.000	Supported
H3a	ENPI → HP	-0.142	0.000	Supported
H3b	ENPI → ECO	0.647	0.002	Supported
H4a	HP → ECO	-0.341	0.003	Supported

Note: **$P < 0.01$; ***$P < 0.001$

After ratifying the fitness of the model, we have calculated the hypothesized association between the different latent constructs. Table 4 displays the hypothesized association and their significance. The findings reveal that renewable energy positively impacts logistics performance, environmental performance, health performance and economic growth. Logistics performance is positively related with economic growth, but is negatively correlated with environmental sustainability/performance. For another side, economic growth and public health expenditure of

countries increase due to poor environmental performance with carbon and greenhouse gas emissions. Moreover, public health expenditure is negatively correlated with economic growth, which confirms that greater public health expenditure slow down the economic growth of countries, due to low efficiency and productivity of labors.

This research examined relationship among renewable energy usage, logistics performance indicators, environmental sustainability, public health expenditure and economic growth of ASEAN states members. Overall, the findings show that the adoption of renewable energy in logistical operations will improve the environmental sustainability significantly, reducing the public health expenditure in terms of low carbon emissions and greenhouse gases. In addition, greater environmental performance and reduction in public health expenditure will spur the economic growth due to maximum efficiency and productivity of labors, while usage of renewable energy in logistical operations and greater environmental performance will portray a positive image of country, which will also attract foreign investors.

The finding shows that renewable energy usage, logistics indicators and environmental performance are positively correlated on 1% confidence level, while 1% increase in renewable energy usage will improve 0.221%, 0.224% and 0.165 to the green logistical operations environmental performance and economic growth of ASEAN countries respectively. Khan et al. (2018) did an empirical research in order to find the effect of renewable energy consumptions on logistical performance. They conclude that green energy significantly enhance the green logistical operations with better environmental sustainability. Because greater consumption of fossil fuel in logistical operations is a cause of environmental degradation, which also increases the trade openness and bring foreign direct investment. Additionally, public health expenditure is reduced due to adoption of renewable energy in business activities. Undeniably, public health expenditure is increased by burning fossil fuel and using polluted energy in vehicles and logistical operations (Aldakhil, 2018).Furthermore, due to poor air quality, different diseases attack human health including asthma brain, and lungs cancer, which reduce to the labor efficiency and productivity.

Seen from the results, logistics operations is positively correlated with economic growth of ASEAN member states on 1% confidence level. Khan et al. (2017a) highlighted that economic growth is mainly based on greater and improved logistical operations and infrastructure for business activities, while polluted vehicles and business activities destroy the environmental sustainability and increase the public health expenditure. They further emphasized that regulatory authorities should establish strict policies to enforce the firms to use renewable energy sources and adopt green practices in their logistical business so as to mitigate carbon emissions and climate change problems for better environmental growth (Imran et al. 2015). Biofuel and green energy should be encouraged by governmental bodies for enhancing environmental beauty and building positive image of the country (Mafakheri & Nasiri, 2014). The renewable energy is a key source that may promote green logistics operations in the ASEAN countries (Bozan, 2015). Li (2014) emphasized that companies adopt renewable energy in their business and logistical vehicles require governmental support so as to increase companies' motivation.

In this article, two environmental determinants have been used, i.e., carbon emissions and greenhouse gas emissions that were significantly influenced by polluted logistical operations. In simple words, due to greater polluted logistical operations, environmental performance of ASEAN countries are reduced. On the other hand, green logistical operations not only contribute to economic growth of country in terms of foreign direct investment inflows and trade openness, but also enhance environmental performance in terms of low carbon emissions and air pollution, which also reduces the public health expenditure and enhances the labor efficiency and productivity. Zawaydeh, (2017) confirmed that green practices implementation and renewable energy usage in business operations will be the attractions to foreign direct investment inflows. Many Western countries ban the pollutant corporations and impose heavily fines on their polluted vehicles (Barysiene et al. 2015). In addition, polluted logistical system also becomes nontariff barrier for companies and decreases the chances of export to European and Western countries (Bolük € and Mert, 2015). An empirical study conducted by Newhouse, (1992) they confirmed that green technology and renewable energy reduce the health expenditure of USA. Fuchs, (1996) as per the health experts, 85% human diseases are related with air and water pollution.

Khan et al. (2018) and Green & Morton, (1998) argued that lower economic growth of some ASEAN countries is correlated with strict environmental policies in European and Western World, because a number of developed countries do not allow polluted vehicles on their sea-port. Khan & Dong, (2017a) and Benitez et al. (2015) found the

strong positive correlation between green logistical vehicles and economic growth. Unquestionably, green practices and green energy use in business operations build positive image of countries and open trade doors. Zhu and Sarkis, (2004) conducted a study in China and found that environmental friendly practices and usage of biofuels would enhance environmental sustainability and spur the economic growth.

The research results revealed that public health expenditure is negatively correlated with economic growth. In simple words, low efficiency and productivity of labor will decrease the economic growth of countries. In similar line, a research was conducted by Aldakhil, (2018) to examine the association between carbon emissions, societal and economic factors. They conclude that greater carbon emissions increase the health expenditure, which is negatively correlated with economic activities. Bloom et al. (2004) put forward a production function, which aggregates labor, human capital and capital stock (experience, health and education). They concluded that health expenditure has positive correlation with economic growth and they further exceeded that most human diseases are related with air and water pollution. In similar line Aurangzeb, (2001) conducted an empirical research and used an augmented Solow Growth model for Pakistan. The findings showed that economic growth of country is positively correlated with health expenditure. Logistics infrastructure plays a significant part in economic growth and fossil fuel emits heavy carbon emissions, which increase the public health expenditure. On the other hand, green energy use and green practices implementation in business and logistical operations enhance the environmental sustainability and reduce the health expenditure without compromising economic growth (Markevych et al., 2014).

Policy Implications

The green logistical activities are well-associated with trade and economic growth, while polluted logistical operations will lead to carbon-emissions increasing and health expenditure. The global logistics operations and vehicles are mainly dependent on fossil fuels. Hence, the analyst requires comprehensive knowledge of biofuels and green energy sources which would considerably mitigate negative effects of logistical operations on environmental beauty and human health. On the other hand, environmental friendly practices and usage of green energy in business operations attract the foreign investors and trade openness with greater environmental sustainability. The greater carbon emissions and public health expenditure have positive correlation with lower FDIs inflows and poor economic growth of ASEAN countries, which primarily causes higher unemployment rate in some ASEAN member states.

There is no doubt that logistic industry acts a vital role in country's economic growth, but polluted logistical vehicles heavily emits carbon emissions, which is a cause of global warming and climate change, which generates adversity on human health.

The overall findings of our research drag to the following policies which would promote the renewable energy/green energy and environmental-friendly practices in the panel of ASEAN member states i.e.

1. Regulatory bodies should offer tax exemptions and subsidies on green vehicles to use green energy sources and implement green practices in logistical operations, which will significantly improve air quality in terms of low carbon emissions.
2. Free trade policy formulation should be based on maximum economic output from trade across the borders.
3. Foreign direct investment inflows should be increased by quality of logistics services and green practices. In addition, environmental friendly practices and usage of green energy in logistical operations build positive image of countries, which also attracts foreign n investors.
4. Economic policies should act as an advantage for introducing maximum, liberalize trade policies, foreign direct investment inflows, and enhance logistics services for the deployment of quality gains.
5. Governmental bodies should discourage polluted vehicles and logistical operations with enforcing heavy taxes and import duties with financial fines on non-green logistical activities. On the other side, government should offer loans to corporate sector for adopting renewable energy sources in their logistical operations and buying green vehicles, which will not only reduce health expenditure but will also improve environmental sustainability with better human health.
6. The collaboration between regulatory authority and logistics industry for enhancing green practices in logistical operations through 'certification schemes' may help to promote sustainable agenda.

The effective logistics management can be an appropriate policy instrument. With quality of logistics and transport-related infrastructure across the ASEAN member states, it would also reinforce the logistics management practices for green business.

Conclusion and Future Recommendations

This research is to find out the linkages between renewable energy, logistics performance indices, public health expenditure, economic & environmental determinants in a panel of ASEAN member states, for the period of 2007 to 2017. The research employs structural equation modelling for evaluating the effect of green energy and logistics performance on public health expenditure economic and environmental factors. The key contribution of this article includes four possible logistics performance indices: public health expenditure, economic sustainability and environmental sustainability as regresses, under the premises of using renewable energy and green practices in logistical operations. Most Previous published literature used primary source of data to evaluate the relationship between green logistics, firms' financial and environmental performance, while this article used time series secondary data of ASEAN member states to evaluate the hypothesis. The results show that polluted logistical operations have significant and negatively effect on human health and environmental sustainability, while greater carbon emissions increase the public health expenditure, which creates pressure on economic growth in terms of inefficiency and low productivity of labors. On the other hand, green logistical operations and usage of renewable energy in logistics activities reduce the carbon emissions and greenhouse gases with greater positive image of country, which attracts foreign direct investment inflows and foreign corporate sectors with greater export opportunities in environmental-strict-policy countries. This study is conducted on a panel of ASEAN member states. The future research should be conducted on OECD (Organization for Economic Co-operation and Development) and BRICS countries and compare the findings to obtain more robust inferences and viability of environmental friendly logistical operations around the globe.

References

Ahmad Alinejad, E., Pishvaee, M. S., & Bonyadi Naeini, A (2018) Key success factors for logistics provider enterprises: an empirical investigation in Iran. *Kybernetes*, *47*(3), 426–440. https://doi.org/10.1108/K-10-2015-0269

Aldakhil, A.M., Nassani, A.A., Awan, U., Abro, M.M.Q., Zaman, K (2018) Determinants of green logistics in BRICS countries: An integrated supply chain model for green business, Journal of Cleaner Production. 195, 861-868.

Anderson JC, Gerbing DW (1988) Structural equation modeling in Practice: a review and recommended two-step approach. Psychol Bull 103(3): 411-423.

Aurangzeb (2001) Relationship between Health Expenditure and GDP in an Augmented Solow Growth Model for Pakistan: An Application of Cointegration and Error Correction Modeling. Lahore J Econ. 8(2):1–18.

Barysiene, J., Batarliene, N., Bazaras, D., Ciziuniene, K., Griskeviciene, D., Griskevicius, A.J., …, Vasiliene-Vasiliauskiene, V (2015) Analysis of the current logistics and transport challenges in the context of the changing environment. Transport 30 (2), 233e241. https://doi.org/10.3846/16484142.2015.1046403.

Bensassi, S., Marquez-Ramos, L., Martinez-Zarzoso, L., Suarez-Burguet, C (2015) Relationship between logistics infrastructure and trade: evidence from Spanish regional exports, Transport. Res. Pol. Pract. 72, 47-61.

Bekhet, H. A., & Othman, N. S (2018) The role of renewable energy to validate dynamic interaction between CO2emissions and GDP toward sustainable development in Malaysia. *Energy Economics*, *72*, 47–61. https://doi.org/10.1016/j.eneco.2018.03.028

Benitez J, LIorens J, FernandezV (2015) ITimpact on talent management and operational environmental sustainability. Inf Technol Manag 16(3):207–220.

Bhattacharya, M., Paramati, S.R., OzturkI Bhattacharya, S (2016) The effect of renewable energy consumption on economic growth: evidence from top 38 countries. Appl. Energy 162 (24), 733e741. https://doi.org/10.1016/j.apenergy.2015.10.104.

Bloom DE, Canning D, PiaMalaney (2000) Demographic Change and Economic Growth in Asia. Suppl Popul Dev Rev. 5: 26: 257–90.

Bloom DE, Canning D Sevilla J (2004) The Effect of Health on Economic Growth: A Production Function Approach. World Dev. 32:1–13.

Boukherroub, T., Ruiz, A., Guinet, A., Fondrevelle, J (2015) An integrated approach for sustainable supply chain planning. Comput. Oper. Res. 54, 180e194. https:// doi.org/10.1016/j.cor.2014.09.002.

Bollen, K.A (1989) Structural equations with latent variables. Wiley, New York.

Bollen KA, Long JS (1993) "Introduction" in testing structural equation models. Sage, Newbury Park.

Bozan, K (2015) The impact of sustainable governance and practices on business performance: an empirical investigation of global firms Pratim Datta. Venugopal Gopalakrishna-Remani 7 (2), 97-120.

Bolük, G., Mert, M (2015) The renewable energy, growth and environmental Kuz- € nets curve in Turkey: an ARDL approach. Renew. Sustain. Energy Rev. 52, 587e595. https://doi.org/10.1016/j.rser.2015.07.138.

Cole MA, Neumayer E (2006) The impact of poor health on total factor productivity. J Dev Stud. 42(6):918–38.

Charfeddine, L (2017) The impact of energy consumption and economic development on Ecological Footprint and CO2emissions: Evidence from a Markov Switching Equilibrium Correction Model. *Energy Economics*, *65*(May), 355–374. https://doi.org/10.1016/j.eneco.2017.05.009

Dangelico, R.M., Pontrandolfo, P (2013) Being "Green and Competitive": the Impact of Environmental Actions and Collaborations on Firm Performance. https://doi. org/10.1002/bse.1828

Dunn SC, Seaker RF, Waller MA (1994) Latent variables in business logistics research: Scale development and validation. J Bus Logist 15(2): 145-172.

Eggoh J, Houeninvo H, Sossou G-A (2015) Education, Health and Economic Growth in African Countries. J Econ Dev. 2015; 40 (1):93–111.

Fuchs V (1996) Economics, Values, and Healthcare Reform. Am Econ Rev. 86(1):1–24.

Garver MS, Mentzer JT (1999) Logistics research methods: employing structural equation modelling to test for construct validity. J Bus Logist 20(1): 33-57.

Hair JF, Black WC, Babin BJ, Anderson RE, Tatham RL (2006) Multivariate data analysis. Pearson Prentice Hall Upper Saddle River.

Hamelinck, C.N., Suurs, R.A.A., Faaij, A.P.C (2005) International bioenergy transport costs and energy balance. Biomass Bioenergy 29 (2), 114e134. https://doi.org/ 10.1016/j.biombioe.2005.04.002.

Hashmati A (2001) On the causality between GDP and Health Care Expenditure in Augmented Solow Growth Model. Stockholm: Department of Economic Statistics Stockholm school of Economics; 2001.

Hilaire EJ, Gilles AS (2015) Education, health and economic growth in developing countries. J Econ Dev. 2015; 40: 93–111.

Hutchins, M.J., Sutherland, J.W (2008) An exploration of measures of social sustainability and their application to supply chain decisions. J. Clean. Prod. 16 (15), 1688e1698.

Imran, M., Rasli, A., Zaman, K (2015) Energy crisis, greenhouse gas emissions and sectoral growth reforms: repairing the fabricated mosaic. J. Clean. Prod. 197525000. https://doi.org/10.1016/j.jclepro.2015.08.017.

Kar M, Taban S (2003) The impacts of the disaggregated public expenditure on economic growth. Ankara University Faculty of Political Science. 2003; 53(3): 145–69.

Ken Green, Barbara Morton, Steve New (1998) Green purchasing and supply policies: do they improve companies' environmental performance?, Supply Chain Management: An International Journal, Vol. 3 Issue: 2, pp.89-95, https://doi.org/10.1108/13598549810215405

Khan, S.A.R., Qianli, D., SongBo, W., Zaman, K., Zhang, Y (2017a) Environmental logistics performance indicators affecting per capita income and sectoral growth: evidence from a panel of selected global ranked logistics countries. Environ. Sci. Pollut. Res. 24 (2), 1518e1531. https://doi.org/10.1007/s11356-016- 7916-2.

Khan, S.A.R., Qianli, D (2017b) Does national scale economic and environmental indicators spur logistics performance? Evidence from UK. Environ. Sci. Pollut. Res. 24 (34), 26692e26705. https://doi.org/10.1007/s11356-017-0222-9.

Khan, S.A.R., hang, Y., Anees, M., Golpira, H., Lahmar, A., Qianli, D (2018) Green supply chain management, economic growth and environment: a GMM based evidence. Journal of Cleaner Production. 185, 588-599.

Khan, S.A.R., Dong, Q.L., Yu, Z (2016a) Research on the measuring performance of green supply chain management: in the perspective of China. Int. J. Eng. Res. Afr. 27, 167e178. https://doi.org/10.4028/www.scientific.net/JERA.27.167.

Khan, S.A.R., Qianli, D (2017a) Impact of green supply chain management practices on firms' performance: an empirical study from the perspective of Pakistan. Environ. Sci. Pollut. Res. 24 (20), 16829-16844. https://doi.org/10.1007/s11356- 017-9172-5.

Khan, S.A.R., Qianli, D., Zhang, Y., Khan, S.S (2017c) Impact of green supply chain on enterprise performance: in the perspective of China. J. Adv. Mfg. Sys. 16 (3), 263e273. https://doi.org/10.1142/S0219686717500160.

Khan, S.A.R., Qianli, D., Wei, S.B., Zaman, K., Zhang, Y (2017b) Travel and tourism competitiveness index: the impact of air transportation, railways transportation, travel and transport services on international inbound and outbound tourism. J. Air Trans. Mgmt. 58, 125e134. https://doi.org/10.1016/ j.jairtraman.2016.10.006.

Kline, R.B (2005) Principles and practice of structural equation modeling. The Guilford Press.

Koufteros, X.A (1999) Testing a model of pull production a paradigm for manufacturing research using structural equation modeling. J Oper Manag 17(4): 467-488.

Laari, S., Töyli, J., & Ojala, L (2017) Supply chain perspective on competitive strategies and green supply chain management strategies. *Journal of Cleaner Production*, *141*, 1303–1315. https://doi.org/10.1016/j.jclepro.2016.09.114

Lee, K.H., Wu, Y (2014) Integrating sustainability performance measurement into logistics and supply networks: a multi-methodological approach. Br. Account. Rev. 46 (4), 361e378. https://doi.org/10.1016/j.bar.2014.10.005.

Li, Y (2014) Environmental innovation practices and performance: moderating effect of resource commitment. J. Clean. Prod. 66, 450e458. https://doi.org/10. 1016/j.jclepro.2013.11.044.

Luthra, S., Garg, D., & Haleem, A (2015) Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry. *Production Planning and Control*, *26*(5), 339–362. https://doi.org/10.1080/09537287.2014.904532

Lu C-S, Lai K-H, Cheng TE (2007) Application of structural equation modeling to evaluate the intention of shippers to use internet service in liner shipping. Eur J Oper Res 180(2): 845-867.

Mafakheri, F., Nasiri, F (2014) Modeling of biomass-to-energy supply chain operations: Applications, challenges and research directions. Energy Policy 67, 116-126. https://doi.org/10.1016/j.enpol.2013.11.071.

Markevych, I., Tiesler, C. M. T., Fuertes, E., Romanos, M., Dadvand, P., Nieuwenhuijsen, M. J., … Heinrich, J (2014) Access to urban green spaces and behavioural problems in children: Results from the GINIplus and

LISAplus studies. *Environment International*, *71*, 29–35. https://doi.org/10.1016/j.envint.2014.06.002

Martel, A., Klibi, W (2016) Supply chains: issues and opportunities. In: Designing Value-creating Supply Chain Networks. Springer International Publishing, pp. 1-43.

Nassani, A.A., Aldakhil, A.M., Abro, M.M.Q., Zaman, K (2017) Environmental Kuznets curve among BRICS countries: spot lightening finance, transport, energy and growth factors, Journal of Cleaner Production (2017), 154:474-487, doi: 10.1016/j.jclepro.2017.04.025

Newhouse JP (1992) Medical Care Costs: How Much Welfare Loss? J Econ Perspect. 6(3):3–21.

Munim, Z.H., and Schramm, H.J (2018) The impact of port infrastructure and logistics performance on economic growth: the mediating role of seaborne trade. Journal of Shipping and Trade. (2018) 3: 1. https://doi.org/10.1186/s41072-018-0027-0

Nunnally, J.C (1978) Psychometric theory, 2nd Edn. McGraw-Hill, New York.

Ojala, L., Kersten, W., Lorentz, H (2013) Transport and logistics developments in the Baltic Sea Region until 2025. J. East West Bus. 19 (1e2), 16-32.

Oni LB (2014) Analysis of the Growth Impact of Health Expenditure in Nigeria. J Econ Finance (JEF). 2014; 3(1):77–84.

Pajunen, N., Aarnio, T., Heiskanen, K., Watkins, G (2016) Value in sustainability: the process industry perspective. Int. J. Sust. Eng. 9 (1), 59-72.

Piabuo, S.M., and Tieguhong, J.C (2017) Health expenditure and economic growth - a review of the literature and an analysis between the economic community for central African states (CEMAC) and selected African countries. Piabuo and Tieguhong Health Economics Review (2017) 7-23.

Qureshi MI, Rasli AM, Zaman K (2016) Energy crisis, greenhouse gas emissions and sectoral growth reforms: repairing the fabricated mosaic. J Clean Prod 112:3657–3666.

Rao, P., Holt, D (2005) Do green supply chains lead to competitiveness and economic performance? Int. J. Oper. Prod. Manag. 25 (9 and 10), 898-916.

Rosseel, Y (2012) Lavaan: an R package for structural equation modeling. J Stat Software 48(2): 1-36.

Savita, K.S., Dominic, P.D.D., Ramayah, T (2012) Eco-design strategy among ISO 14001 certified manufacturing firms in Malaysia: green drivers and its rela- tionship to performance outcomes. In: 2012 International Conference on Computer and Information Science, ICCIS 2012 - A Conference of World Engi- neering, Science and Technology Congress, ESTCON 2012 - Conference Proceedings, 1, pp. 154e159. https://doi.org/10.1109/ICCISci.2012.6297230.

Shahbaz, M., Solarin, S.A., Sbia, R., Bibi, S (2015) Does energy intensity contribute to CO 2 emissions? Atrivariate analysis in selected African countries. Ecol. Indic. 50 (24), 215-224.

United Nation, (2014) Climate summit-2014: catalyzing action. Global Green Freight Action Plan. UN Climate Summit. Online available at: http://www. greengfreighteurope.eu/news/global-green-freight-action-plan-presented-atun-climate-summit.aspx (accessed on March 30, 2017).

Uygun, Ö., & Dede, A (2016) Performance evaluation of green supply chain management using integrated fuzzy multi-criteria decision making techniques. *Computers & Industrial Engineering*, *102*, 502–511. https://doi.org/10.1016/j.cie.2016.02.020

World Bank Database, (2017) https://data.worldbank.org [Accessed on May 2018]

World Health Organization, (2017) World Health Statistics 2017: Monitoring health for the SDGs. [Accessed on July 27, 2018]

World Health Organization (2005) Make every mother and child count. The World Health Report. 2005 [Accessed on June 29, 2017]

Wu, H.-J., Dunn, S.C (1995) Environmentally responsible logistics systems. Int. J. Phys. Distrib. Logist. Manag. 25 (2), 20e38. https://doi.org/10.1108/ 09600039510083925.

Yumuşak IG, D Yıldırım C (2009) An econometric examination over the relation between health expenditure and economic growth. J Knowl Econ Knowl Manage. 2009; IV: 57–70

Zaman, K., Shamsuddin, S (2017) Green logistics and national scale economic indicators: evidence from a panel of selected European countries. J. Clean. Prod. 143, 51e63. https://doi.org/10.1016/j.jclepro.2016.12.150.

Zawaydeh, S (2017) Economic, environmental and social impacts of developing energy from sustainable resources in Jordan. Strategic Plan. Energy Environ. 36 (3), 24e52. https://doi.org/10.1080/10485236.2017.11810169

Zhu, Q., Sarkis, J., Cordeiro, J.J., Lai, K.-H (2008) Firm-level correlates of emergent green supply chain management practices in the Chinese context. Omega 36 (4), 577e591. https://doi.org/10.1016/j.omega.2006.11.009.

Zhu Q, Sarkis J (2004) Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. J Oper Manag 22:265–289.

Zoundi, Z (2016) CO2 Emissions, Renewable Energy, and the Environmental Kuznets Curve: A Panel Co-integration Approach. Renewable and Sustainable Energy Reviews, (in press).

Appendix

Table 5: List of ASEAN Countries

S. No.	Country name	Code
1	Brunei Darussalam	BRN
2	Cambodia	KHM
3	Indonesia	IDN
4	Lao PDR	LAO
5	Malaysia	MYS
6	Myanmar	MMR
7	Philippines	PHL
8	Singapore	SGP
9	Thailand	THA
10	Viet Nam	VNM