Environmental, Social and Economic Growth Indicators Spur Logistics Performance: From the Perspective of South Asian Association for Regional Cooperation Countries

Abstract:

This article examines the association between green logistics operations, social, environmental and economic indicators of SAARC (South Asian Association for Regional Cooperation) countries. The research used GMM (Generalized Method of Moments) and FGLS (Feasible Generalized Least Squares) two methods to tackle the problems of heterogeneity, serial correlation and heteroskedasticity. The findings show that fossil fuel consumption is at the heart of logistics operations; the more fossil fuel and non-green energy resources that are used, the more negative effects on society and environmental sustainability result from this. A lower quality of transport-related infrastructure and logistics services is negatively correlated with fossil fuel usage, carbon emissions, health expenditure, greenhouse gas emissions and political instability of SAARC countries. Conversely, efficient customs procedures and greater information sharing among supply chain partners increase trade opportunities and also improve environmental sustainability in terms of minimum carbon emissions due to the shorter waiting and queue times involved. Further, the application of green energy resources and green practices can mitigate negative effects on social and environmental sustainability due to better logistics operations while improving financial performance in terms of higher GDP per capita, trade openness and greater export opportunities around the globe. As there is very limited research using green practices relationship with macro-level indicators in current literature, this research will assist both practitioners and policymakers to understand the roles of green supply chain and green logistics in enhancing environmental sustainability, social improvement and economic growth for a better future.

Keywords: Political stability index; Renewable energy sources; Green logistics management; Environmental and Economic sustainability.

Introduction

Global logistics play a crucial role in global SCM (supply chain management). Logistics management involves a series of integrated activities covering information processing, freight transport, material handling, inventory storage and sharing information with supply chain members involved in moving products (Martel and Klibi, 2016). In recent decades, global logistics has been an area of interest for practitioners and academics due to its impact on social, economic and environmental factors (Khan and Dong, 2017a). A number of enterprises, with a view to achieving social, environmental and economic benefits, have implemented green practices in their supply chains. However, green practices usually add huge costs to systems due to lack of customer awareness and government supports in terms of poor environmental laws and regulations (Khan et al., 2016; Halkos and Skouloudis, 2018). During the adoption of green supply chain practices, supply chain members play significant and different roles. These include community activists, government regulators, international competitors and non-governmental organizations, all triggering factors for firms to adopt a certain level of commitment to protect environmental sustainability (Hassini et al., 2012).

The continuation of fossil fuel burning and emission of greenhouse gases result in global warming effects, climate change and more severe storm activities (Hayami et al., 2015). It is recognized that until now, the regulatory authorities have failed to use their environmental-sustainability policies effectively to control environmental degradation. McMichael et al. (2008) warned that social and environmental issues must be addressed; communities and governments are worried at the effects of the proliferation of global supply chain operations and transport activities. Due to high levels of pollution, diseases are affecting our society; these include weakening of lung function, neurobehavioural disorders and asthma attacks (Khasnis and Nettleman, 2005; Khan et al., 2018). Since the 1970s, global carbon emissions have increased by 90% (Herold and Lee, 2017) with emissions from fossil oil burning and industrialization contributing around 78% of the total CO2 emissions (IPCC, 2014). The IEA (International Energy Agency) highlighted three key reasons for carbon pollution: industry, transportation and electricity. The biggest contributor to carbon emissions is electricity production which accounts for 42%; transportation and industrial emissions are around 23% and 19% respectively (IEA, 2015). Undeniably, global supply chains and transportation activities are heavily based on energy consumption. Anable et al. (2012) suggested that transport sectors always develop on the basis of energy. Zaman and Shamsuddin (2017) carried out research on panel data collected from European countries. Their results showed that energy demand has strong positive relationships with both logistics operations and a country’s economic growth.

Geng et al. (2017) conducted research to identify the association between enterprise performance in some manufacturing companies in Asian countries and green supply chains. They argued that green supply chain practices generally enhance performance in four aspects - operational, environmental, social and economic performance. Zhu et al. (2005) and Zhu and Sarkis (2004) argued that the financial performance of firms in China is not enhanced by green practices, while the ideology of green supply chain practices was in its early stage. Generally, the initial adoption of green practices requires heavy investment that incurs huge fixed costs into end-to-end supply chain systems and has a negative effect on a firm’s financial performance in the short-term. From another perspective, in the last few years, many studies have found positive association between firms’ financial performance and green supply chain practices (Centobelli et al., 2018; Khan et al., 2018; Khan and Dong, 2017a; Zaman and Shamsuddin, 2017; Park et al., 2016; Khan et al., 2016; Hartmann et al., 2015; Zhao and

Zhang, 2012; Prajogo et al., 2012; Diabat and Govindan, 2011; Pagell, 2004; Anstine, 2000).

Research Objectives

This research is different from already published articles in many aspects. The previous studies mainly examined the association between green logistics operations and different manufacturing firms' financial and environmental performance by using firm-level surveys and/or case studies. But the key objective of this research is to observe the correlation between logistics operations and the social, environmental and economic indicators on a macro level in a panel of SAARC member states from 2001 to 2016. As far as we know, this research is the first to integrate the sustainability factors, including economic sustainability, environmental sustainability and social sustainability with green logistics indices in a panel of SAARC member countries.

This paper has five sections, the introduction included. The second is based on literature review and hypothesis development with the third section providing methodological procedure. The results and discussion are presented in section four. Finally, the conclusions and practical implications are shown in section five.

Literature Review and Hypothesis Development

In the last decade or so, world attention has been given to the integration of social, economic and environmental issues that focus on mitigation of waste and emissions (Jayaraman et al., 2014; Tan and Zailani, 2010). Countries' economic performance has been improved through global supply chain operations and industrialization. On the other hand, a number of social and environmental problems have arisen due to carbon emissions and global warming. Enterprises are now implementing green practices in their operations such as green distribution, green purchasing, green warehousing, green transportation and ecological design of products to improve socio-economic and environmental sustainability.

The correlation between energy demand and logistics has been largely discussed under SCM, while from the perspective of logistics indicators, green sources of energy are needed for environmental sustainability (Centobelli et al., 2018). Zaman and Shamsuddin (2017) highlighted that energy would be largely consumed in supply chain operations, a serious factor adding to climate change and environmental degradation. Khan and Dong (2017b) suggested that firms should adopt ecological design and renewable energy resources in their supply chain practices to improve environmental sustainability. The total energy consumption of the world projected to 2040 determines a continuous development trend to green energy consumption (Azad et al., 2015). Compared with non-renewable energy sources, a renewable energy source is inexpensive, thus encouraging firms to choose green energy sources. Bhatacharya et al. (2016) suggested that green energy will become a solution to environmental sustainability and can be implemented with the help of green regulations. In the last few years, renewable energy sources have been the fastest-growing of new energy sources. The world energy consumption by energy source is presented in Fig.1. The detailed literature review with hypothesis is presented in the sub-sections mentioned below.

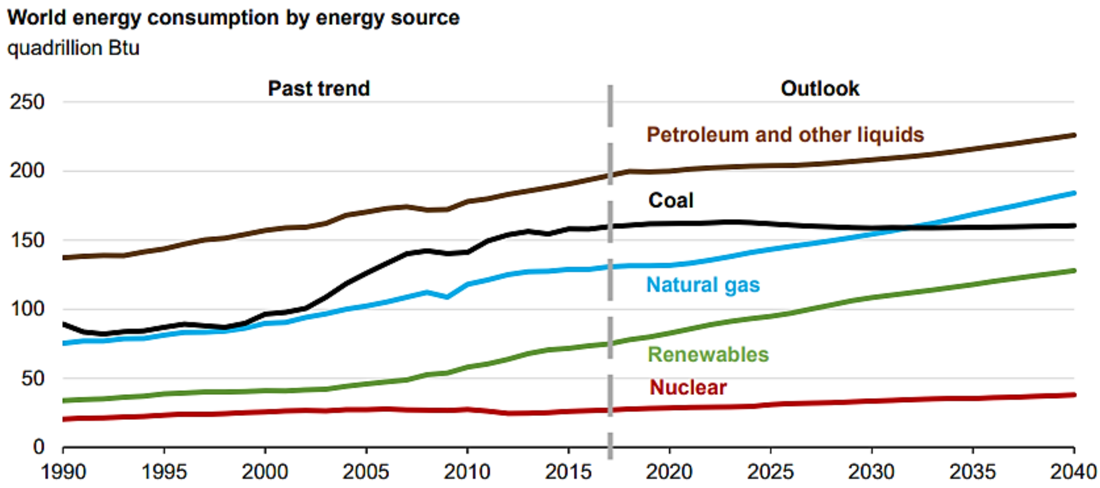

Fig. 1 World energy consumption by energy source

(Source: EIA, International Energy Outlook 2017)

Relationship between green logistics and countries' economic development

To develop the relationship between green logistics and countries' economic development, research papers are reviewed as mentioned in Fig.2. Based on this extensive review process, a total of 96 relevant papers were finally selected for this study; all are cited in the text and mentioned in the reference list. Out of this list, some papers are used for hypothesis development in the following sub-sections.

The reduction of wastes is stressed in green practices, correlated with environmental sustainability. In practice, elimination of waste will also lead to improved economic performance of a company. Economic development has a strong relationship with sustainable logistics operations, while green practices of logistics management accommodate economic development (Medeiros and Ribeiro, 2017; Khan and Dong 2017a; Green et al., 2012). Green operations in SCM are not only perceived to be instrumental in increasing market share, but also enhance customer loyalty and improve firms' economic performance (Jayaraman et al., 2014; Chan, 2001). Undeniably, logistics and supply chains have played an important part in countries' economic development. On the other hand, throughout the world, the CO2 emissions caused by the logistics industry account for around 13% of all CO2 emissions (World Economic Forum, 2016). Similarly, global supply chain and logistics operations, as facilitators of international trade, can thus be regarded as a major cause of CO2 emissions (Herold and

Lee, 2017). Khan et al. (2017a) conducted research based on a panel of 15 countries from 2007 to 2015. The results showed that logistics competence and infrastructure significantly improve countries' economic health. Further, the results indicated that energy demand enhances industry value and economic growth, while green logistics and supply chains promote sector growth and foreign direct investment inflows. Zhu and Sarkis (2004) conducted research in the Chinese market; their findings showed that green logistics practices increase firms' profitability in the long-term.

Wanzala and Zhihong (2016) highlighted that non-green logistics systems discourage foreign investors and also generate heavy costs in the supply chain and logistics operations due to fewer export opportunities and inefficient customs clearance. Green supply chain activities are not only protecting environmental sustainability but also enhancing enterprise financial performance in terms of waste reductions and the adoption of green energy sources (Hartmann et al., 2015). The implementation of green technology and practices in logistics management not only positively influences coordination and integration with supply chain stockholders but it also improves operational, financial and environmental performance for a firm (Schniederjans and Hales, 2016). Zaman and Shamsuddin (2017) conducted research in European countries to determine the correlation between economic indicators and green logistics. Their results showed that green logistics practices appeal to greater FDI inflow and can also be a driving factor of sustainable environment. Further, the findings confirmed that foreign direct investment inflows and clean energy resources are both significantly and positively interconnected with green logistics management while greater carbon dioxide emissions and the consumption of fossil fuels are negatively correlated with green supply chain and logistics performance. Based on the above mentioned studies, we develop the following hypothesis (Zaman and Shamsuddin, 2017).

H1: Green logistics operations are positively correlated with economic indicators.

Relationship between green logistics practices and macro-level environmental factors

Green supply chain is an opportunity for industry to protect environment sustainability from the harmful effects caused by non-green supply chain operations (Park et al., 2016). Freight transport and other relevant supply chain activities will negatively influence the global environment without appropriate green policies. In other words, logistics and transportation activities are a major cause of environmental pollution, global warming and climate change. Firms who have started to implement green supply chain and logistics practices to improve their performance have also had to face the complexity of managerial decisions and performance assessment (Prasanta and Walid, 2013). Büyüközkan and Cifçi (2011) argued that firms could reduce 80% of harmful effects on the environment during their operations through the adoption of green practices. Khan and Dong (2017b) conducted research on manufacturing firms in Pakistan. Their study measured green logistics and supply chain practices by five exogenous variables; these were cooperation with customers (CWC), green manufacturing, ecological design, green information systems (GIS) and green purchasing. The findings showed that most green practices in logistics have a positive relationship with firms' environmental performance. Banerjee (2001) suggested that integrating environmental sustainability programs into company strategic planning will promote an overall capability to mitigate uncertainties, promote a more positive image and reputation of a business while increasing market share (Hart, 1995). Tsoulfas and Pappis (2006) and Luthra et al. (2016) stressed that adopting green practices in supply chain and logistics operations leads to reduction of waste, increases energy efficiency and enhances environmental sustainability with a mitigation in carbon emissions (Herold and Lee, 2017; Khasnis and Nettleman, 2005).

Lai and Wong (2012) investigated green logistics management and its implications in the Chinese market. The results revealed that green logistics contributes to environmental sustainability improvement, while regulatory authority and customer pressure promote the implementation of green practices and the use of green energy resources in supply chain and logistics operations. Aldakhil et al. (2018) confirmed that environmental sustainability is significantly affected by global logistics activities, these in turn being largely influenced by fossil fuel and energy consumption. Khan and Dong (2017a) explored the correlation among logistics performance, national scale economic and environmental indicators from the perspective of the United Kingdom. The results indicated that green practices in logistics activities have significant and positive correlation with renewable energy consumption, while fossil fuel has a negative relationship with green logistics. Further, results confirmed that economic health (Khan et al., 2018) and environmental sustainability are enhanced due to green practices in logistics activities. McMichael et al. (2008) highlighted that greater emissions create a number of health and environmental problems such as pulmonary cancer, mesothelioma, bronchitis, neurobehavioral disorders, liver and other problems leading to cancer (Khasnis and Nettleman, 2005). The polluted logistics operation is a major cause of climate change and global warming. This cannot be resolved without taking serious measures such as enforcing strict environmentally-friendly policies, encouraging firms to adopt green initiatives and promoting customer awareness (Wanzala and Zhihong, 2016).

H2: Green logistics practices have a positive correlation with greater environmental sustainability.

The relationship between green logistics and macro-level social indicators

Most businesses have negative and harmful effects on our society due to heavy air and water pollution (Zaman and Shamsuddin, 2017; Khan et al., 2017a). For decades, firms have been mainly focusing on CSR (corporate social responsibility) to reduce their harmful effects on human lives. The signaling theory suggests that information sharing with other firms in a business sector is significantly helpful for handling information irregularities; it is crucial for companies to signal their CSR in some countries when there is a shortage of governmental regulations. Companies want stakeholders to understand that they are proactive in preventing sanctions (Rodríguez et al., 2014). Visser (2008) explained that the social responsibility of firms is to be engaged in healthcare, education, influencing political reforms and maintaining cultural traditions of caring for the weak in society (Campbell, 2007; Baskin, 2006).

In some countries, firms undertake more social responsibilities in different sectors including education, research and development and healthcare, due to the absence of government social regulations; firms may realize that the government is unable to provide enough social services. Rodríguez et al. (2014) highlighted that long-term political stability is a key contributing factor to reducing social concerns. Tengku et al. (2011) argued that firms are investing money in social work and healthcare as a marketing strategy to brand their image in domestic and international markets. This raises questions in two areas. In the first place, with 'sustainable products' and 'corporate social responsibility' as vital features in branding activities, company strategies follow the rationale of maintaining corporation reputation. Secondly, non-government organizations discuss rationality through the media by presenting simple and single issues and their impact (Müller et al., 2009).

Trade opportunities between countries may be inhibited by linguistic differences. The costs associated with communication problems among partners speaking totally different languages is notable (Beitzen-Heineke et al., 2017). If business partners from two countries speak similar languages, the trade between them will be much smoother than trade between partners who speak totally different languages; communication costs will be different. Furthermore, a language barrier also creates difficulties for firms during the choice of green suppliers in foreign countries, inspection of suppliers and collaboration with foreign firms on green/sustainability projects. It is true that "efficiency of green supply chain knowledge aggregation will be greatly improved if the knowledge can be expressed with a common language". Language reflects people's mindsets and cultural attributes. For instance, in most SAARC (South Asian Association for Regional Cooperation) countries - consisting of India, Bangladesh, Nepal, Afghanistan, Maldives, Bhutan, Sri Lanka and Pakistan - people speak similar languages and appreciate the similarities in their cultures and lifestyles (SAARC, 2018). These countries also have very similar business norms and values, making information sharing and collaboration easier; sustainable projects can be more easily established (Yune et al., 2016).

Clougherty and Grajek (2014) found strong evidence in the common-language effects; when implementing high levels of ISO 9000 and ISO 14000, country-pair trade was seen to increase. The capacity of common standards in removing communication barriers among partners has been stressed by a majority of researchers (e.g., Abdul et al., 2018; Bénézech et al., 2001; Casper and Hancké, 1999). Aldakhil et al. (2018) highlighted that global logistics operations are a main cause of air and water pollution in BRICS countries, while green practices may resolve a number of environmental and social problems. In addition, due to the adoption of green practices, governments may better control a number of human diseases such as asthma, lung cancer and a range of brain disorders. Khan et al. (2018) conducted an empirical study on developed countries. Their findings revealed that green practices significantly mitigate social problems and reduce health expenditure. On the basis of the above mentioned studies, the following hypothesis is built.

H3: Greater green practices in logistics operations will significantly ease social problems.

Research gaps and highlights

The extensive literature review of this study, as shown in Fig. 2, shows that there have been a large number of studies identifying the correlation between green logistics practices, green supply chain operations and enterprise performance. But in this review, only a few studies are conducted on the macro-level to test the association between green logistics efficiency and macro-level indicators. For instance, research (Aldakhil et al., 2018; Khan et al., 2018; Khan et al., 2017b) on the effects of environmental logistics performance indicators on GDP growth and industry development in the context of European countries has been published. The findings showed that the share of industry, manufacturing and service in GDP is influenced by greenhouse gases and carbon emissions. Logistics advantages and infrastructures enhance added value and financial growth. In previous studies, researchers have not examined macro-level social factors to determine the relationship between the social indicators and green supply chain business and/or green logistics operations. This research will examine the relationship between green logistics performance index (GLPI) and macro-level social, environmental, economic indicators. The systematic literature review process and research plan are shown in Fig. 2.

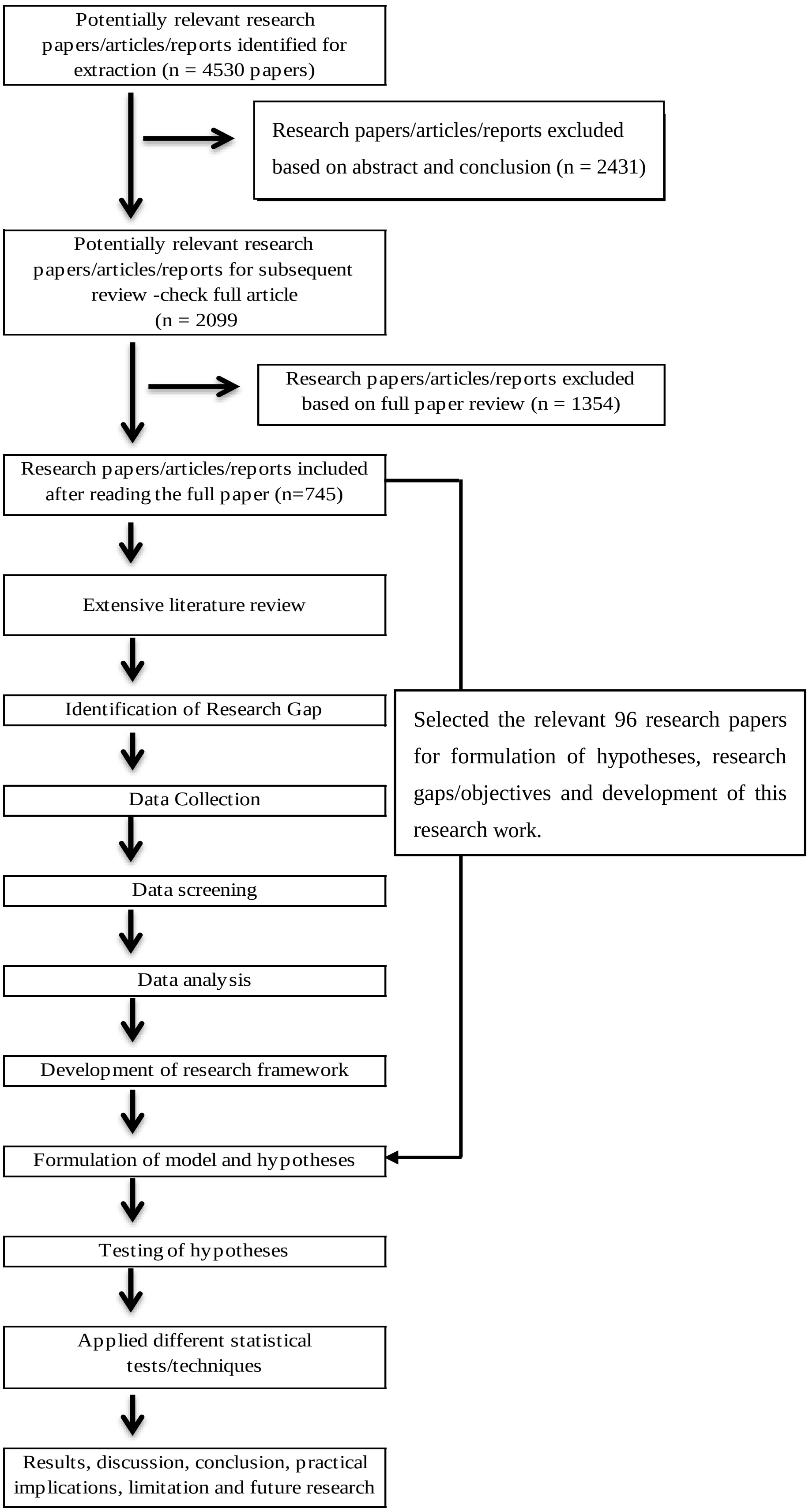

Fig. 2 The Systematic Literature Review Process and Research Plan

Methodology and Data Source

This study draws the correlation among green logistics, economic health, environmental and social factors in a panel of SAARC countries. There is no doubt that logistics and supply chain operations have a crucial role in national economic development. On the other hand, it also creates a number of social and environmental problems in the absence of green policies and green practices. For that reason, this study has linked global logistics operations with economic, social and environmental factors under national scale economic indicators that promote green supply logistics operations across countries and regions. The following equation is based on our hypothesis.

$$\mathrm{L}_i = \alpha_0 + \beta_1 \mathrm{Soci}_i + \beta_2 \mathrm{Envt}_i + \beta_3 \mathrm{Ecoc}_i + \beta_4 \mathrm{Cont}_i + \varepsilon_i (1)$$

Log = a + terrorism + e

Where L indicates logistics performance involving LPIQLS (logistics performance index: competence and quality of logistics services), LPICPS (logistics performance index: arranging competitively priced shipments), LPIQTTI (logistics performance index: quality of trade and transport related infrastructure) and LPICCP (logistics performance index: efficiency of customs clearance process). Soci shows the CPLI (countries' political stability index), HSP (health spending as percent of GDP) and SGI (social globalization index covering information flows and cultural proximity). Envt indicates environmental indicator covering FFUEL (fossil fuel energy consumption), CO2 (carbon emissions), REC (renewable energy consumptions) and TGHT (total greenhouse gas emissions. Ecoc shows the economic health indicators of countries including TOP (trade openness), GDPPC (gross domestic product on per capita) and FDI. Cont shows control variables including IVD (industry value added), AVD (agriculture value added, MVD (manufacturing value added), while the constant and error corrections in the model are represented as α and ε respectively. Furthermore, i shows the number of SAARC countries and t indicate the time period used in equations 1 to 6.

In this study, the panel data of SAARC countries are downloaded from the World Bank website to test our hypotheses. The equation given below examines the performance of green logistics practices.

$$\mathrm{L}_{it} = \alpha_0 + \beta_{1t} \mathrm{Soci}_{it} + \beta_{2t} \mathrm{Envt}_{it} + \beta_{3t} \mathrm{Ecoc}_{it} + \beta_{4t} \mathrm{Cont}_{it} + v_t + \varepsilon_{it} (2)$$

The sample of panel data often encounters the issues of heteroskedasticity and auto correlation; these can be misleading in the correct estimation of our statistical model. The autocorrelation (Abdul et al., 2018) is the disturbance term correlated with any variable of the model that has not been affected (Attari et al., 2016) by the disturbance term related to other variables in this model. On the other hand, the problem of heteroskedasticity in panel data can be expressed quite simply; heteroskedasticity emerges when the variance of the error terms differs across observations (Simpson, 2012). The serial correlation and heteroskedasticity can be resolved by the FGLS model (Abdul et al., 2018; Maddala and Lahiri, 2006; Judge et al., 1985). In FGLS, heteroskedasticity is allowed but no cross-sectional correlation (Greene, 2012; Davidson and

Mackinnon, 1993). The asymptotic efficiency of FGLS may not be acceptable over a small sample size because of the variability introduced by the estimation. Griliches and Rao (1969) argued that FGLS is more efficient and more suitable than least squares for a big sample size; FGLS is able to overcome heteroskedasticity and autocorrelation.

With equation 2 containing country fixed effects and time effects, this model has the country-specific heterogeneity that is unobserved. In this research, this problem is dealt with through transforming these detailed equations with the first differencing estimators as suggested by Arellano and Bond (1991) i.e. dynamic panel generalized method of moment's estimators that mitigate the issues of heterogeneity and serial relationship.

We examined the endogenity of the independent variables with Durbin-Wu-Hauman procedure with 2SLS for the panel data involved; it was proved that some independent variables are endogenous. Furthermore, those exogenous and endogenous variables are defined in the equation forms given below;

$$LPIQLS_{it} = HSP_{it}\gamma_1 + MVD_{it}\gamma_2 + IVD_{it}\gamma_3 + AVD_{it}\gamma_4 + Soci_{it}\beta_1 + CPLI_{it}\beta_2 + CO2_{it}\beta_3 + TGHG_{it}\beta_4 + TOP_{it}\beta_5 + GDPPC_{it}\beta_6 + Fossil_{it}\beta_7 + REC_{it}\beta_8 + FDI_{it}\beta_9 + \mu_i + v_{it} = Z_{it}\delta + \mu_i + v_{it} \quad (3)$$

$$LPICPS_{it} = CPLI_{it}\gamma_1 + HSP_{it}\gamma_2 + IVD_{it}\gamma_3 + AVD_{it}\gamma_4 + Soci_{it}\beta_1 + FDI_{it}\beta_2 + CO2_{it}\beta_3 + TGHG_{it}\beta_4 + TOP\beta_5 + GDPPC_{it}\beta_6 + Fossil_{it}\beta_7 + REC_{it}\beta_8 + MVD\beta_9 + \mu_i + v_{it} = Z_{it}\delta + \mu_i + v_{it} \quad (4)$$

$$LPIQTTI_{it} = Soci_{it}\gamma_1 + CPLI_{it}\gamma_2 + HSP_{it}\gamma_3 + GDPPC_{it}\gamma_4 + CO2_{it}\gamma_5 + TGHT_{it}\gamma_6 + IVD_{it}\gamma_7 + AVD_{it}\gamma_8 + TOP_{it}\beta_1 + FDI_{it}\beta_2 + Fossil_{it}\beta_3 + REC_{it}\beta_4 + MVD_{it}\beta_5 + \mu_i + v_{it} = Z_{it}\delta + \mu_i + v_{it} \quad (5)$$

$$LPICCP_{it} = CPLI_{it}\gamma_1 + HSP_{it}\gamma_2 + IVD_{it}\gamma_3 + MVD_{it}\gamma_4 + AVD_{it}\gamma_5 + Soci_{it}\beta_1 + FDI_{it}\beta_2 + TOP_{it}\beta_3 + GDPPC_{it}\beta_4 + Fossil_{it}\beta_5 + REC_{it}\beta_6 + CO2_{it}\beta_7 + TGHT_{it}\beta_8\mu_i + v_{it} = Z_{it}\delta + \mu_i + v_{it} \quad (6)$$

In equations 3 to 6, $\text{LPICCP}_{it,}$ LPIQLS_{it} LPIQTTI_{it} and LPICCP_{it}, are dependent variables.

The variables shown with coefficient γ are a set of observations on g_2 and endogenous variables included as covariates with coefficients noted asγ; these variables are allowed to be interconnected with v_{it}; on the other hand, the variables with coefficients β are observations on the exogenous variables included as covariates.

Z_{it} are the instruments (Newey and West, 1994) which can be exogenous, endogenous variables (Windmeijer, 2000; Arellano and Bond, 1991) with lags of independent variables (idvs) and dependent variables (dvs).

δ is a K x 1 vector of coefficients, where $K = g_2 + k_1$

Usually the problems of serial correlation, heteroskedasticity and heterogeneity in panel data can be resolved by using panel GMM (generalized method of moments) (Khan et al., 2018; Attari et al., 2016; Bölük and Mert, 2015). The GMM estimator also performs better in a situation where the cross-section identifiers are large in numbers as compared to the small numbers of a time period (Alonso-Borrego and Arellano, 1999). For this research, it is appropriate to choose panel GMM of modeling as the cross-section identifiers of 8 countries; the time period from 2001 to 2016 is used as a sample time period in the research. This study has selected a panel of SAARC states.

Results and Discussion

Seen from Table 1, most dependent and independent variables obey a positive mean and standard deviation and have a meaningful distribution peak; this shows the high logistics performance including LPIQLS, LPICPS, LPIQTTI and LPICCP. The value of index 5 represents high logistics performance and a value of 1 indicates low logistics performance i.e. (5 ¼ high to 1 ¼ low) from the panel of selected SAARC countries with healthy economy that improves GDP per capita (GDPPC) annual growth, manufacturing value added (annual % growth), industry value added (annual % growth), trade openness (% of GDP), agriculture value added (annual % growth) and FDI net inflows (% of GDP).

Table 1: The descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
LPIQLS	2.326682	0.3684211	1.3	3.17442
LPICPS	2.272389	0.4357558	1.1	3.337178
LPIQTTI	2.572901	0.4309712	1.22	3.364115
LPICCP	2.490813	0.4248317	1.25	3.387064
SGI	28.52679	10.43838	5.93	48.85
CPLI	-1.049244	1.148586	-2.81	1.3
HSP	5.142881	2.209141	2.47	13.73
FDI	2.018922	2.757996	-0.098375	17.29
TOP	69.09069	42.70522	25.5453	204.585
GDPPC	6.046121	3.977888	-8.12474	21.0206
FFUEL	50.52538	21.55254	8.615539	73.1653
REC	52.95769	27.17372	3.21669	95.1643
CO2	0.8048392	0.6701468	0.031078	2.80025
TGHT	419413.3	817409.9	1467.57	3000000
IVD	25.62384	8.36465	13.243	45.3757
MVD	12.43794	4.80606	4.34081	20.8588
AVD	20.8728	9.40702	3.2626	38.59

HSP (health expenditure spending % of GDP) and environmental sustainability are significantly influenced by positive means and standard deviation values of TGHG in metric tons per capita, FFUEL in total energy consumption and CO2 in metric tons per capita that can be reduced with the substitute of REC in total energy consumption share. Moreover, the more clean and green energy in global logistics is used, the less health expenditure will be. Undeniably, CPLI (countries' political stability) enhances logistics and trade activities. But unfortunately, in SAARC member states, CPLI has negative mean and standard deviation values, which directly and indirectly create negative effects on the social, environmental and financial performance of the countries (Fig. 3 shows the plots of level data during 2001 - 2016).

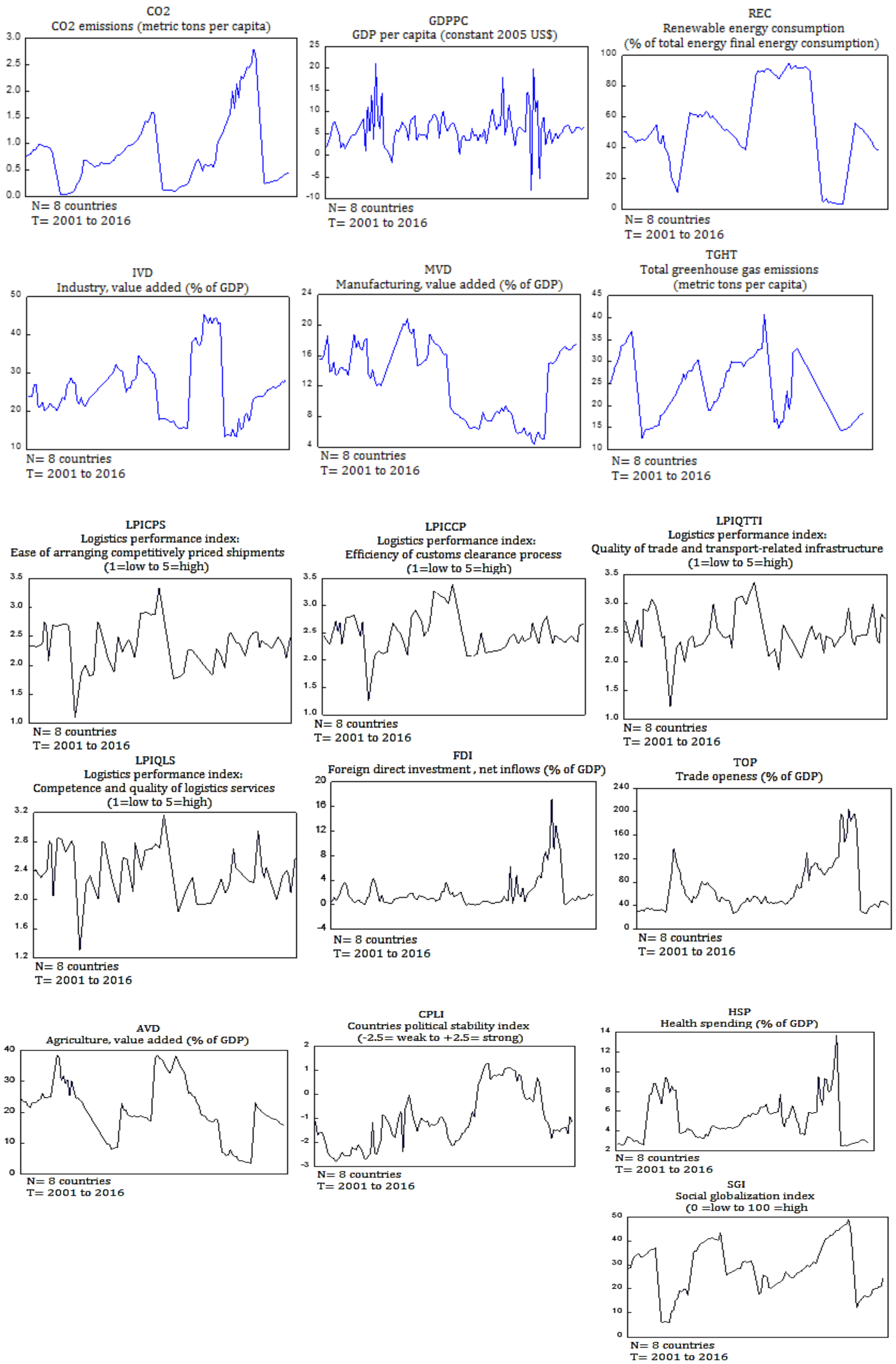

Fig. 3: Plots of Level Data

Table 2 illustrates the correlation matrix; it can be seen that there is a different impact on logistics performance from the social and environmental indicators. REC (renewable energy consumption) may significantly reduce environmental degradation and enhance environmental sustainability. Conversely, HSP (health expenditure spending % of GDP) has negative relationships with logistics operations, industry and manufacturing added value. Because logistics and industrialization are heavily dependent on FFUEL and energy consumption, this not only influences environmental development but also damages people's health.

Undeniably, political stability helps economic and social development. But in SAARC countries, political stability is very poor and for this reason, CPLI is negatively correlated with FDI, SGI and TOP. On the other hand, SGI is strongly and positively correlated with logistics FDI, GDPPC and TOP. Put simply, strong political stability enhances the economic and social growth of a country, while environmental degradation may be controlled through the adoption of REC and green logistics practices.

Table 3 indicates the findings of OLS, FE and RE effects; the values of coefficients of TGHG, CPLI and CO2 are negatively correlated with poor logistics and transport-related infrastructure. In simple terms, poor transport and logistics infrastructure are the significant contributors to environmental degradation such as high temperature, heavy air pollution, water and waste pollution and climate change. Poor political stability of a country is a major cause of poor logistics operations and performance as well as low-level quality of logistics services and transport infrastructure. Greater efficiency of LPICCP is positively correlated with GDP per capita, industry and manufacturing added value, while manufacturing added value activities are also decreased by poor quality of logistics services.

Table 2: Correlation Matrix

Variables	LPICCP	LPICPS	LPIQLS	LPIQTTI	AVD	CO2	FDI	FFUEL	GDPPC	HSP	IVD	MVD	CPLI	REC	SGI	TGHT	TOP
LPICCP	1																
LPICPS	0.9603	1															
LPIQLS	0.9001	0.9008	1														
LPIQTTI	0.8002	0.8515	0.7066	1													
AVD	-0.4454	-0.5010	-0.3275	-0.6834	1												
CO2	**0.8626**	**0.8074**	**0.7644**	**0.7924**	0.4876	1											
FDI	0.5447	0.4515	0.3784	0.4922	0.3318	0.5526	1										
FFUEL	**0.7065**	**0.8204**	**0.5916**	**0.8661**	0.6524	0.7234	0.5337	1									
GDPPC	0.4976	0.4658	0.3450	0.3696	0.6307	0.3184	0.2745	0.3020	1								
HSP	**-0.2912**	**-0.4437**	**-0.2755**	**-0.6458**	0.7321	0.3594	0.3217	-0.7770	-0.1196	1							
IVD	0.7490	0.7539	0.5654	0.7668	0.8578	0.6885	0.3576	0.6912	0.7823	**-0.4657**	1						
MVD	0.5854	0.6439	0.4505	0.7788	0.9764	0.5931	0.3849	0.7607	0.6489	**-0.7500**	0.9175	1					
CPLI	0.0539	0.0536	-0.0856	-0.1280	0.1252	0.0023	-0.1081	-0.0092	0.5526	0.3403	0.3673	0.1458	1				
REC	-0.6861	-0.7998	-0.6009	-0.8614	0.6273	0.7416	0.5447	-0.9932	-0.2334	0.7902	0.6399	0.7303	0.0729	1			
SGI	**0.3247**	**0.2495**	**0.3993**	**0.4642**	0.5715	0.5873	**0.2971**	0.2601	**0.2041**	0.4285	0.4196	0.5389	**-0.3037**	**0.3151**	1		
TGHT	**0.8310**	**0.7694**	**0.6569**	**0.5774**	0.2236	0.8198	0.3303	0.5390	0.4270	0.0446	0.6449	0.3639	**0.4058**	**0.5123**	**0.1178**	1	
TOP	0.3085	0.1963	0.2001	0.0481	0.2449	0.2475	0.1278	-0.1329	0.6133	0.4260	0.5020	0.2148	**-0.5977**	**0.1876**	**0.0773**	**0.5138**	1

Table 3: The estimations of OLS, FE and RE Effects

Variables	OLS-dv1	FE-dv1	RE-dv1	OLS-dv2	FE-dv2	RE-dv2	OLS-dv3	FE-dv3	RE-dv3	OLS-dv4	FE-dv4	RE-dv4
	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t	b/t
SGI	0.032	0.03	0.032	-0.004	-0.069	0.0014	-0.021	0.057	0.021	0.006	0.094	0.006
	(0.69)	(0.27)	(0.69)	(-0.01)	(-0.85)	(0.01)	(-0.41)	(0.60)	(0.41)	(0.16)	(1.36)	(0.16)
CPLI	-0.123*	-0.21*	-0.123**	-0.114	-0.252**	-0.114*	-0.135*	-0.309**	-0.135***	-0.151*	-0.253**	-0.151*
	(-2.49)	(-2.02)	(-2.69)	(-0.68)	(-3.19)	(-2.18)	(-2.17)	(-3.21)	(-5.70)	(-1.99)	(-2.91)	(-1.99)
HSP	-0.084	-0.242	-0.084	-0.157	-0.634	-0.157	-0.124	-0.703	-0.124	-0.153	-0.635*	-0.153
	(-0.41)	(-0.57)	(-0.41)	(-0.81)	(-1.96)	(-0.81)	(-0.55)	(-1.89)	(-0.55)	(-0.86)	(-2.32)	(-0.86)
FDI	0.066	0.019	0.066	0.082	-0.103	-0.082	-0.113	0.162	0.113	-0.055	0.084	0.055
	(0.66)	(0.11)	(0.66)	(0.88)	(-0.78)	(-0.88)	(-1.04)	(1.07)	(1.04)	(-0.64)	(0.75)	(0.64)
TOP	0.01	0.013	0.01	0.004	0.003	0.004	0.004	-0.009	0.004	0.003	-0.003	0.003
	(0.87)	(0.64)	(0.87)	(0.35)	(0.19)	(0.35)	(0.3)	(-0.49)	(-0.3)	(0.27)	(-0.23)	(-0.27)
GDPPC	0.057	0.048	0.057	-0.054	0.021	0.054	-0.06	0.024	-0.06	0.04*	0.03**	0.04*
	(1.89)	(0.92)	(1.89)	(-1.91)	(0.53)	(1.91)	(-1.84)	(0.52)	(-1.84)	(2.51)	(3.03)	(2.46)
FFUEL	0.034	0.015	-0.034	0.044	0.014	-0.044*	0.035	0.024	-0.035	0.034	-0.012	0.034
	(1.46)	(0.17)	(-1.46)	(2.02)	(0.23)	(-2.02)	(1.37)	(0.34)	(-1.37)	(1.72)	(-0.23)	(1.72)
REC	0.012	-0.024	0.012	0.021	0.014	0.021	0.013	0.002	0.013	0.02	0.003	0.02

	(0.71)	(-0.32)	(0.71)	(1.33)	(0.01)	(1.33)	(0.72)	(0.03)	(0.72)	(1.41)	(0.05)	(1.41)
CO2	-0.458*	-1.45*	-0.458**	-0.346	-0.002	-0.346	-0.671***	0.184**	-0.671*	-0.002*	-0.165**	-0.002*
	(-2.51)	(-2.16)	(-3.19)	(-0.50)	(-0.10)	(-0.50)	(-7.83)	(-3.13)	(-1.99)	(-1.98)	(-2.68)	(-2.24)
TGHT	-0.002	-0.022***	-0.002**	-0.031*	-0.042**	-0.031***	-0.026*	-0.026**	-0.026*	-0.026	-0.056*	-0.026**
	(-0.05)	(-6.35)	(-3.05)	(-2.17)	(-2.89)	(-7.81)	(-2.46)	(-3.29)	(-2.54)	(-0.73)	(-2.43)	(-2.73)
IVD	0.064	0.236	0.064	0.044	0.113	0.044	0.085	0.144	0.085	0.062*	0.171*	0.062**
	(0.82)	(1.7)	(0.82)	(0.61)	(1.07)	(0.61)	(1.01)	(1.19)	(1.01)	(2.43)	(2.29)	(3.29)
MVD	-0.087*	-0.338*	-0.087*	0.004	0.008	0.001	0.057	0.005	0.057	0.045	0.131*	0.045*
	(-2.50)	(-1.97)	(-2.51)	(0.004)	(0.04)	(0.01)	(0.36)	(0.02)	(0.36)	(0.36)	(2.55)	(2.36)
AVD	-0.01	-0.071	-0.01	-0.006	0.058	0.006	0.005	0.059	-0.005	0.01	0.025	0.01
	(-0.32)	(-0.88)	(-0.32)	(-0.2)	(0.97)	(0.2)	(0.15)	(0.86)	(-0.15)	(0.37)	(0.48)	(0.37)
Intercept	1.786***	0.184	1.786***	3.591***	4.889***	3.591***	2.407**	6.071**	2.407***	2.31***	3.086***	2.31***
	(6.46)	(0.02)	(8.46)	(7.04)	(6.69)	(9.10)	(3.25)	(3.74)	(9.58)	(6.71)	(8.51)	(6.71)

Note: dv1 show LPIQLS; dv2 specify LPICPS dv3 show LPIQTTI; dv4 represent LPICCP, RE indicate random effect model; FE show fixed effect model OLS indicate ordinary least square

*** show significance at 1%; ** show significance at 5%; * show significance at 10%

In Table 4, we can see the FGLS and GMM estimation regression. Four environmental factors are used in this research, i.e. fossil fuel consumption, greenhouse gas emissions, renewable energy consumption and CO2 emissions under the influence of logistics performance index. The findings revealed that CO2 emissions are significantly and negatively correlated with LPIQLS (logistics performance competence and quality of logistics services) and LPIQTTI (quality of trade and transport-related infrastructure). 0.067% and 0.092% carbon emissions are mitigated because of 1% increase in the quality of logistics services and transport-related infrastructure. Logistics activities are mainly based on transportation movement and transportation is a main cause of carbon emissions. Dekker et al. (2012) found that the transport sector is mainly accountable for water and air pollution, not only damaging environmental sustainability but also contributing to several health issues such as asthma attacks, lung function weakening, mesothelioma, pulmonary cancer and acute lower respiratory infections in children. Sharma and Gandhi (2016), Bechtsis et al. (2017) and Liu et al. (2016) suggested that higher taxation should be imposed on polluting vehicles so as to protect environmental sustainability. Bektas et al. (2016) also emphasized that green distribution and transportation systems are needed to mitigate harmful effects on humans, fauna and flora. On the other hand, fossil fuel consumption has negative relationships with LPIQLS and LPICCP on 1% and 5% confidence level. The poor infrastructure of transport and logistics increases consumption of fossil fuel by 0.048% and 0.033%, creating harmful effects on environmental sustainability; this also increases fuel and maintenance costs of vehicles. Leigh and Li (2015) suggested that promoting renewable energy and biofuels is a better option to control global warming and environmental degradation.

In our findings, GHG (greenhouse gas emissions) is noticeably and negatively related with LPIQTTI and LPICCP on 1% level of confidence. So we can say that inefficient customs clearance operations are a significant cause of GHG; logistics services and transport infrastructure quality significantly affects greenhouse gas emissions. A huge volume of trade creates substantial pressure on customs authorities, resulting in the custom clearance process being prolonged. Results show that 1% improvement of efficiency in customs clearance processes and transport-related infrastructure's quality will significantly reduce greenhouse emissions by 0.026% and 0.023% respectively. Zawaydeh (2017) stated that logistics industries play a significant role in a country's economic health improvement. It is apparent that logistics operations is central in generating emissions that have created various environment-related issues such as carbon emissions, global warming, human, flora and fauna diseases. In addition, LPIQLS has a negative relationship with greenhouse gas emissions; 1% increase in logistics operations will reduce greenhouse gas emission by 0.013% (Gold and Seuring, 2011). It must be stressed that biofuels and renewable energy sources will maintain the beauty of the environmental while achieving strong economic growth (Abid et al., 2012). The adoption of clean energy and biofuels is the first step to green logistics implementation. The corporate sector themselves cannot implement it in their business and logistical activities without the political support of government and environmental-friendly legislation.

REC (renewable energy consumption) has negative correlations with LPICPS, LPITTI, and LPICCP, as can be seen from the results. We can see from the table that 1% increase in quality of logistics, trade and transport-related infrastructure means that REC is reduced by 0.021%, 0.015% and 0.023% respectively. In other words, the consumption of renewable energy has a critical and negative correlation with logistics performance because of the huge fixed costs involved in the use of green energy as well as lack of regulatory authority support (poor environmental legislation, no promotion of renewable energy usage in industry and transport sector and zero subsidies on green investment). With the huge fixed cost involved in green energy investment and lack of support from government or customer base, it is difficult for those enterprises already involved in green practices to survive. In fact, Datta et al. (2015) confirmed that bio-energy is a feasible energy resource that may improve logistics performance in business activities under environmental constraint. Mafakheri and Nasiri (2014) and Khan et al. (2016a) argued that biofuels and green energy sources do not have a bright future without proper environmental legislation and government support for tax exemptions on biofuels and renewable energy projects. The transportation industry is intensively based on fossil fuel consumption. That becomes the reason for heavy carbon emissions, a basic cause of global warming and climate change. Also, Li (2014) argued that firms using renewable energy in their logistics systems require governmental support to spur their initiatives. Furthermore, renewable and green energy sources may ease environmental degradation; by using biofuels and renewable energy in transportation and logistics operations, firms can build a competitive edge, resulting in greater customer loyalty, a better image in international markets and more export opportunities to European countries with central environmental policies.

This research used three economic health indicators including FDI (foreign direct investment inflows), GDPPC (gross domestic product on per capita) and TOP (trade openness % of GDP) under the influence of LPI. Results show that GDPPC has a negative relationship with poor LPIQLS at 5% confidence level. In simple terms, poor quality of logistics services will reduce economic growth in terms of GDP per capita. The quality of logistics services plays a vital role in improving a country's economic health and also in attracting foreign customers to buy more products and materials. In addition, 1% reduction in logistics services quality leads to 0.061% reduction in country GDP per capita. Khan and Dong (2017a) carried out work showing that logistics has a significant relationship with firms' economic performance and firms can increase their overall performance by improving logistics services.

Similarly, Bose and Pal (2012), Barysiene et al. (2015) and Benitez et al. (2015) found a strong relationship between a firm's financial performance and green logistics. In addition, ecological practices in logistics operations positively affect a country's GDP per capita (Khan et al., 2017b). An empirical study by Zhu and Sarkis (2004) showed that green practices adopted in the transport and logistics industry slowdown environmental degradation and also enhance firms' financial performance. On the other hand, the results show that FDI (foreign direct investment) and logistics performance have no significant relationship in the context of SAARC countries.

A larger volume of trade openness reflects countries' economic health and foreign investment inflows. Our findings suggest that TOP (trade openness) is associated with LPICCP and LPIQTTI positively and significantly at 1% and 5% confidence levels. This means that 1% increase in the efficiency of customs clearance process will improve trade openness by 0.018% and 1% improvement in transport-related infrastructure will increase trade openness by 0.046%. Generally in SAARC countries, logistics-related infrastructure and efficiency of customs are very poor due to unskilled workforces and less efficient equipment. Most work is done manually, a main cause of delays in the end-to-end clearance process. In addition, a culture of bribery is very common especially in India, Nepal and Bhutan. In many instances, customs officials intentionally create delays in the clearance process to gain more bribery money.

With poor transport-related infrastructure, polluting logistics vehicles, inefficient customs clearance processes and a bribery culture, trade opportunities with European countries will be reduced; a negative image of a country in the international market will be built due to its implementation of non-green practices and less environmentally friendly legislation in their global logistics operations (Bölük and Mert, 2015). Results show that greater trade openness has significant and negative correlation with poor green logistics performance; these findings are supported by earlier published research including Abdul et al., 2018; Ruparathna and Hewage, 2015; Wanzala and Zhihong, 2016; Yune et al., 2016 and Wandersee et al., 2012. They have highlighted that too much pollution from logistics systems and inefficient customs clearance processes reduce trade opportunities. In addition, in SAARC countries, logistics and transport-related infrastructure are very poor due to a variety of reasons including lack of implementation of government policies, high rates of corruption and poor political stability.

This research used three social factors - HSP (health expenditure spending % of GDP), CPLI (countries' political stability index) and SGI (social globalization index covering information flows and cultural proximity). The results show that CPLI is connected with logistics performance negatively including LPIQTTI, LPIQLS and LPICCP on 1%, 5% and 10% confidence level respectively. The findings reveal that 1% increase in long-term political stability in countries will improve the quality of logistics, transport infrastructure and efficiency of customs clearance processes by 0.021%, 0.015% and 0.017% respectively. Unfortunately, in SAARC countries, political stability is very poor and in many cases the government is under dictatorship or military control. In addition, some countries of the SAARC union suffer from terrorist attacks and governments are unable to control and/or enforce their legislation over their geographical boundaries. Rodríguez et al. (2014), Heldeweg et al. (2015) and Tengku et al. (2011) highlighted that long-term political stability is an important factor for reducing social concerns, improving countries' economic health and enhancing environmentally-friendly legislation effectiveness (Bush et al., 2015; Datta et al. 2015; Acquaye et al., 2015; Khan and Dong, 2017a). Long-term political stability builds strong and powerful legislation systems. Over the last 40 years, most SAARC countries have been suffering from different issues including military dictatorship, terrorism attacks, natural disasters, civilian fighting with military and warfare with neighbouring countries; these all lead to poor political stability, poor economic progress and lack of environmental legislation.

The poor infrastructure of transport and logistics has a negative and significant relationship with HSP (health expenditure spending % of GDP) at 1% confidence level. 1% increase in poor logistics and infrastructure related with transport will increase health expenditure by 0.011%. In SAARC countries, transport and logistics-related infrastructure are generally in very poor condition. In fact, in SAARC countries, some metropolitan cities have no pavements or roads for smooth and efficient driving. Due to poor transportation-infrastructure urban conditions, several pollution-related diseases are on the rise including asthma attacks, high blood pressure, eye infections and breathing problems. Burrell et al. (2006) said that polluting operations in firms have negative effects on our society including human health problems due to air pollution. Khan et al. (2017a) examined some European countries, concluding that health expenditure has had to be increased because of polluting activities of logistics and industrialization; this situation can be greatly improved through the adoption of green practices in logistics and supply chain management. Khan et al. (2017b) highlighted that green logistics not only increases economic performance but also makes a big contribution to reducing social and environmental problems. In recent years, in some countries of the SAARC union such as Pakistan, India and Sri Lanka, governments have raised awareness of green products with better environmental legislation. But still, there is more improvement required in terms of logistics and transport-related infrastructure.

The results imply that SGI (social globalization index covering information flows and cultural proximity) has a positive and significant relationship with LPICCP at 5% confidence level. 1% increase in the SGI will lead to 0.062% improvement in LPICCP. This means that greater information flows and higher cultural awareness of a country's customs, rules and regulations will make the customs clearance process easier. On the other hand, poor information flows and cultural proximity will result in significant delays in customs clearance. In addition, long queues and unnecessary delays in customs clearance will not only result in greater carbon and greenhouse emissions, but also increase end-to-end supply chain costs and show a negative image of the country in the international market. Beitzen-Heineke et al. (2017) highlighted that greater information sharing between parties will increase trade opportunities (Bénézech et al., 2001) collaborations and also reduce misunderstanding among supply chain members (Yune et al., 2016; Beitzen-Heineke et al., 2017).

Greater information sharing also helps firms during the selection of green suppliers in foreign countries, inspection of suppliers and collaborating with foreign firms on green/sustainability projects. “Efficiency of green supply chain and green logistics knowledge aggregation is significantly boosted and/or improved when knowledge can be exchanged with common language.” Language is an instrument to reflect people’s mindsets and their cultural attributes. People in India, Nepal, and Pakistan speak similar languages; similarities in their culture and lifestyle can be seen. In this environment, information sharing will be much easier between supply chain partners due to the similarity of language.

Table 4: The Regression Results

	FGLS-LPIQLS	GMM-LPIQLS	FGLS-LPICPS	GMM-LPICPS	FGLS-LPIQTTI	FGLS-LPIQTTI	FGLS-LPICCP	GMM-LPICCP
	b/t	**b/t**	**b/t**	**b/t**	**b/t**	**b/t**	**b/t**	**b/t**
AVD	-0.018	0.011	0.021	0.059	-0.002	-0.053	-0.002	-0.017
	-0.81	(0.560)	0.971	(0.288)	(-0.10)	(-0.206)	(-0.11)	(-0.437)
CO2	-0.092*	-0.458	-0.031*	-0.345	-0.078*	-0.067*	-0.071	0.0137
	(-1.99)	(-0.527)	(-2.11)	(-0.554)	(-2.23)	(-2.149)	(-0.19)	(0.002)
FDI	-0.113	-0.066	-0.056	-0.081	-0.119	-0.113	-0.041	-0.054
	(-1.48)	(-0.598)	(-0.83)	(-0.649)	(-1.47)	(-0.774)	(-0.72)	(-0.522)
FFUEL	-0.048***	0.034	-0.039**	0.043	-0.035*	0.034	-0.033**	0.034
	(-3.37)	(1.521)	(-3.07)	(2.535)	(-1.97)	(1.573)	(-2.81)	(1.787)
GDPPC	-0.061**	-0.057	-0.051*	0.053	-0.060*	0.062	-0.032	-0.047
	(-2.94)	(-3.706)	(-2.40)	(4.641)	(-2.48)	(5.088)	(-1.68)	(-2.414)
HSP	-0.014	0.084	0.010*	0.017	-0.011***	0.012	-0.019	0.015
	(-1.19)	(0.560)	(2.01)	(1.392)	(-3.71)	(1.488)	(-1.421)	(1.155)
IVD	-0.091	0.063	0.058	0.0442**	-0.102	0.085	-0.059	0.062
	(-1.851)	(0.814)	(1.361)	(2.824)	(-1.740)	(0.915)	(-1.451)	(1.135)

MVD	-0.041	-0.086	-0.013**	-0.0265*	0.068	0.056	0.031	0.044
	(-1.20)	(-0.670)	(-2.94)	(1.991)	(0.631)	(0.291)	(0.521)	(0.454)
CPLI	-0.015**	-0.012	-0.015	-0.011	-0.021***	-0.013	-0.017*	-0.014
	(-2.91)	(-0.657)	(-1.64)	(-0.735)	(-6.47)	(-0.764)	(-2.17)	(-1.033)
REC	-0.016	0.011	-0.021*	-0.021**	-0.015***	0.013	-0.023*	0.024
	(-1.481)	(1.365)	(-2.041)	(-2.809)	(-5.17)	(0.779)	(-2.31)	(2.156)
SGI	-0.043	0.031	0.041	0.044	0.022	0.0205	0.062**	0.063*
	(-1.419)	(0.716)	(1.211)	(0.012)	(0.621)	(0.350)	(2.881)	(2.550)
TGHT	-0.013*	-0.0203	-0.021*	0.031	-0.023***	0.025	-0.020***	-0.0262***
	(-2.141)	(-0.066)	(-1.984)	(1.167)	(-5.731)	(0.384)	(-6.171)	(-3.994)
TOP	0.014	0.011	0.034	0.0391	0.046**	0.0394*	0.018***	0.0271**
	(-1.411)	(1.347)	(-0.614)	(0.537)	(3.211)	(1.976)	(8.251)	(3.131)
Intercept	0.435***		3.616**		2.839***		2.591***	
	(6.60)		(3.23)		(8.97)		(11.22)	

Note: ***show significance at 1%; **show significance at 5%; *show significance at 10%

Conclusion

The position that worldwide logistics should have in supporting economic, social and environmental activities is a critically controversial topic in the context of modern supply chain management. This debate is further complicated by the green logistics processes and operations that are correlated with green energy sources; other factors to be considered are poor political stability, impact on human health, environmental degradation and social problems that are also interlinked with SAARC countries' economic activities. This study employs FGLS and GMM models to explore the correlation among logistics performance, economic, environmental and social factors.

The findings reveal that poor quality of transport-related infrastructure and trade is significantly correlated with green energy resources, carbon emissions, greenhouse gas emissions, fuel consumption, health expenditure and countries' political instability. With poor transport-related infrastructure, logistics activities generate greater greenhouse gas and emissions of carbon, not only creating environmental degradation but also creating problems for human health including asthma, lungs and eye infections. In addition, political instability is also a serious cause of poor logistics and transport-related infrastructure. Most SAARC countries are suffering from military rule or dictatorship, terrorism attacks and/or civilian wars. Due to lack of support from regulatory authorities in promoting biofuels and renewable (energy) resources, many enterprises are using fossil fuel energy unwillingly - a major cause of environmental degradation. Transport-related infrastructure and trade are positively associated with trade openness, confirming that a higher quality of transport-related infrastructure increases trade and business activities. Furthermore, a higher quality of logistics services and transport-related infrastructure is a primary indicator of boosting countries' economic growth and reducing fossil fuel consumption.

Green logistics policies are needed to restrict fossil fuel use and polluting practices in logistics operations so as to mitigate environmental degradation. The study investigates environmental, economic and social factors to identify the correlations between them and logistics performance indexes. These results will assist in drawing up green logistics policies and legislation which would be beneficial for promoting green practices. Renewable energy resources in logistics and supply chains will help to decrease carbon emissions, protect fauna and flora and control climate change. An environmentally-friendly and green logistics system creates advantages in global competition, builds a strong economy and facilitates greater social and environmental sustainability. Furthermore, green practices play a significant part in resolving many social, environmental and economic problems. Implementation can improve the general health of the population, reduce carbon and greenhouse gas emissions, improve GDP per capita and increase trade opportunities, especially with European countries. It is undeniable that environmental-friendly policies and renewable energy sources are absolutely essential to boost green practices in global logistics operations in order to balance a country's social, environmental and financial performance.

Research Implications

Per capita income reflects a country's economic wealth, while the effects on environment that logistics activities create are correlated with environmental degradation and also negatively affect the countries' social and economic development. The eco-friendly policies and green practices in the transport and logistics industry are negatively correlated with fewer FDIs inflows, which in turn will lead to a higher unemployment rate. Without doubt, the logistics sector critically contributes to carbon emissions as well as climate change – this has long term serious implications for humanity. Legislation and policies for promoting eco-friendly logistics activities and promoting a healthy economy are required for our well-being. The following are the most appropriate policies:

i) Decrease CO2 and GHG emissions related to freight transport by promoting environmentally friendly practices adoption and biofuels/green energy usage in the transport and logistics industry.

ii) Green industry development should be supported and protected by environmental friendly policies.

iii) Regulatory authority and government policies should support green industry development.

v) Governmental bodies should levy import duties and heavy taxes on polluting materials and fossil fuels; relevant authorities also should impose financial penalties on non-green polluting logistics activities to discourage polluting operations.

vi) Governmental banks and/or regulatory banks of state should offer low-interest loans to firms to help them with renewable and green energy sources.

Study Limitations and Future Research

In future research, some limitations should be removed (Kaiser et al., 2008). We conducted this research only on a panel of SAAR countries. The self-selection biases of the country may affect the result, leading towards over representation of the study results (Khan et al., 2018; Yadav and Pathak, 2016). Moreover, the study is restricted to measuring the correlation between logistics performance and environmental, social and economic indicators. Hence, future researchers may carry out work on a micro-level (Hage et al., 2009). This study explores the relationships among environmental, social and economic indicators with green logistics operations in the SAARC member states; future research may be conducted in ASEAN countries and comparative research can be conducted between SAARC countries and other countries.

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