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Article

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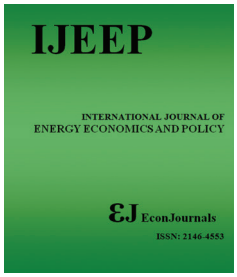

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Tourism Sustainability: Climate Change and Carbon Dioxide Emissions in South Africa

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ABSTRACT

In line with the 2030 Agenda of Sustainable Development initiated by the United Nations, a climate-resilient development strategy is in a need for the South African tourism. Following the principles of sustainable tourism development, the empirical analysis in this study intends to discover the dynamic relationship between climate change and tourism demand in South Africa. With the adoption of the "Triple Bottom Line" framework, our findings revealed the essential steps for South Africa to address the environmental, social, and economic factors necessary for the development of a sustainable tourism. By adopting the Autoregressive Distributed Lag (ARDL) approach, the present study confirmed that carbon emission leaves a negative impact on the tourism industry in South Africa. Therefore, it is crucial for the tourism practitioners and policy makers to improve the economic efficiency by paying more attention on the carbon dioxide emissions to balance the tourism development and environmental protection for long term sustainable growth for the South African tourism.

Keywords: Climate Change, Sustainable Development, Tourism Demand, ARDL Approach, Triple Bottom Line
JEL Classifications: P48; Q54; Z3

1. INTRODUCTION

Climate change is the defining global issue of our time. The climate has an interwoven relationship with the tourism industry, playing a crucial role in influencing the attractiveness of tourism destinations. It has become a kind of truism that a sustainable development is vital for the tourism industry and should be the centre of attention for tourism practitioners, policy makers and industry players. The concern for sustainable development began when the Brundtland Report stated that intergenerational equity is simply unachievable, unless the impacts of environmental on economic activities are constructively addressed (WCED, 1987). Ironically, mass tourism brings detrimental environment impacts due to the amount of human activities involved in promoting tourism. This focuses particularly on the carbon emissions generated by local economic development, including the tourism sector, to promote a more viable economy especially in developing countries. Indeed, the diversity of tourism activities can contribute to government revenues, employments, transportations, and foreign income investment, but preferably not at the expense of the environment as we are striving towards achieving net zero carbon emission. As such, a sustainable development of tourism sector is crucial to play a pivotal role in nurturing a circular economy that is more bearable, equitable, and viable for a nation's growth.

According to the World Tourism Organization (UNWTO), the export earnings generation from world tourism was at USD5 billion a day in 2019, indicating the importance of tourism in export diversification to reduce trade deficits. The global tourism sector generated USD1.7 trillion in exports in the same year, which accounted for 6.8% of global exports and 28.3% of global services exports (WTTC, 2020). At a regional level, the African region received 73.1 million international tourist arrivals with an increment of 5.0%. Such significant growth had generated

USD38.4 billion tourism receipts with an increment of 2.2% (UNWTO, 2020). Furthermore, the tourism industry contributed USD24.6 billion in tourism receipts or 7.0% of South Africa's GDP, and created 1.48 million jobs or 9.1% of total employment in 2019.

Despite its promising growth prior to 2020, the South African tourism has also been hit by climate change. The climate crisis has adversely affected parts of east and southern African, leaving at least 33 million people within the region at the risk of poverty, food insecurity, fear, disasters, and unemployment. The environmental problems are also developmental problems. Compared to the 1880s, the global mean temperature has already increased by 0.65°C, but this increment is at least 1.5 times higher in South Africa since five decades ago as reported by the African Climate and Development Initiative of the University of Cape Town. Ziervogel et al. (2014) have also emphasized that the area's carbon dioxide emissions per capita are relatively higher compared to the other countries located within the African continent. Even though the World Meteorological Organization (WMO) has reported that the carbon dioxide emissions have dropped by 6% globally due to the COVID-19 pandemic, this can only be treated as a temporary good news. WMO anticipates that the emissions will return to normal once the global economy starts to recoup from the pandemic.

The United Nations (UN) has initiated the 2030 Agenda for Sustainable Development with its core anchored on 17 Sustainable Development Goals (SDGs). Within the African continent, a comprehensive plan for the South African tourism can improve the local employments and participation of tourism without neglecting the natural environment. In this way, the inequality can be reduced, and the economic growth can be spurred. This primarily contributes to the 13th SDG on Climate Action. However, the plan can only be successful if there is a strong sense of commitment from all stakeholders for a sustainable future. In spite of the immense potentials, South African tourism is still suffering from climate change impacts and particularly affected the local economic development. Considering the effect of the sustainability and climate change on the tourism sector in South Africa, this study intends to better understand the dynamic relationship among the key variables using the Autoregressive Distributed Lag (ARDL) cointegration procedure and Granger causality tests for key policy- and decision-making processes.

2. LITERATURE REVIEW

Studies on the South African tourism is not new, but not many have considered its causal relationship with climate change and contribution towards achieving the 2030 Agenda for Sustainable Development (Binns and Nel, 2002; Akinboade and Braimoh, 2010; Rogerson, 2012; Srinivasan et al., 2012; Phiri, 2016; Adeola et al., 2018). Mearns (2016) emphasized that the inclusion of climate change is important to examine the responses of different industries and identify plausible direction towards substantial reductions in Greenhouse Gas (GHG) emissions. Recent studies that had focused on sustainable tourism and climate change include McKercher et al. (2010); Weaver (2011); Ziervogel et al. (2014); Fitchett et al. (2016); Rogerson (2016), Sheller (2020) and León-Gómez et al. (2021). Pandy (2017) investigated its causal relationship and concluded that the tourism ecosystem requires expansive and adaptive actions towards a sustainable future. Suharyono and Digdowiseiso (2021) investigated the impact of environment quality on the tourism industry in Indonesia and discovered a positive correlation between the quality of environment and inbound tourist arrivals. However, not many studies have been done for South Africa, and this paper intends to fill this gap by providing some insights for future tourism planning.

To enhance the sustainability of South African tourism, this study adopted the conceptual framework of "Triple Bottom Line" developed by Elkington (1994), which is traditionally known as a sustainable strategy in economics. This framework can be a philosophical orientation for organizational implementation as opined by Stoddard et al. (2012). Consistent with the proposal made by Alhaddi (2015), this study has applied an integrated framework of social, environment, and economic realms. Its relevance to the tourism industry can be traced to the work done by Ferreira and Harmse (2000), who expressed those socio-economic challenges can exist in many situations, such as when tourists are worried for their personal safety when considering to travel to South Africa. In this case, the absence of violence or terrorism acts as a proxy variable for crime risk (Soh et al., 2019). From the environment perspectives, CO_2 is the primary GHG emitted via human activities and has a significant role in affecting tourism demand (Akadiri et al., 2020; Dogru et al., 2020). The nation's GDP and exchange rate represent the financial line to evaluate the economic performance in South Africa. The ARDL bounds testing approach is employed to investigate the long run relationship among the variables in this study. The ARDL approach has been found useful in many previous tourism studies, which provided promising statistical evidence for different countries (González-Gómez et al., 2012; Srinivasan et al., 2012; Jalil et al., 2013; Fareed et al., 2018; Murshed, 2018; Puah et al., 2018a; Puah et al., 2018b; El Menyari, 2021).

Published literature has shown that economic restructuring is crucial in tourism-driven development countries. From a trade perspective, the tourism sector is the key exchange earner and serve as a growth engine for a country. It is also treated as the main-export oriented sector that can generate more foreign earnings than other economic sectors. Moreover, the sector is capable of generating multiplier effects in terms of employment creation and income generation (Shuifa et al., 2011; Manzoor et al., 2019; Shvets, 2020). Ntibanyurwa (2006) emphasized that the diversity of tourism development is interlinked with financial influx. Tourism-driven activities include communication, transportation, craft sales, hotels or homestays, tour guides, entertainment and others. According to UNWTO, the overall contribution of the tourism sector towards employment is about 10%. Therefore, it is vital to ensure a continuous growth for the tourism industry that can enhance economy prosperity.

However, a thriving economy needs to have sustainable growth on top of a continuous growth. The importance of tourism is always granted by the share of gross domestic product (GDP)

and employment (Bulin et al., 2014). The concept of sustainable tourism has emerged and been presented in various forms, such as rural tourism and ecotourism or Pro Poor Tourism (Dorin-Paul, 2013). Since the early 90s, the highly debated concept of sustainable tourism aims to eliminate the possible unfavourable impacts that might overshadow its benefits for the local communities (Dodds and Butler, 2009). It is undeniable that the conventional mass tourism can generate revenues, diversify job opportunities and encourage wealth transfer from more advance countries to emerging countries. However, Liu (2003) and Weaver (2006) pointed out that alternative tourism does not necessary imply growth, but it is essential in achieving a specific economic and social objective of the nation.

3. METHODOLOGY

This study used quarterly data from 2010Q1 through 2019Q4. The conceptual framework follows the "Triple Bottom Line" developed by Elkington (1994). Sustainability, in this context, refers to a balance of the three fundamental pillars-environmental protection, social equity and economic growth. A balanced relationship signifies sustainability. The proxy variables for each pillar included CO_2 (the proxy for environment impact); absence of violence and terrorism (the proxy for social safety); GDP (the proxy for economic performance); and exchange rate (the proxy for economic vitality). To achieve sustainability, climate issues must be addressed as well because it is not purely an environmental problem, but also developmental for South Africa.

The ARDL approach introduced by Pesaran and Shin (1999) was employed to assess the tourism demand in South Africa. Unlike other cointegration techniques such as Engle and Granger (1985) and Johansen (1988), the pre-testing for unit roots is not essential using ARDL technique. This obviates uncertainty (Narayan, 2004), not to mention that the technique also fit-well to the small data sample, such as the one used in this study. A total of five variables were identified, which included tourist arrivals, GDP, exchange rate, political stability and CO_2. In the ARDL estimation procedure, the existence of long-term relationship between the selected explanatory variables is determined through bound testing procedure for the upper and lower bound critical values. A conclusive decision of the existence of long run cointegration can be make if the computed *F*-statistic is larger than the upper critical value. If the F-statistic falls within the upper and lower bound critical values, then the existence of a long run cointegration becomes inconclusive. Lastly, if the F-statistic is smaller than the lower bound value, we do not reject the null hypothesis of no cointegrating vector among the parameters. The hypotheses of bound testing are as follows:

$$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0 \quad (1)$$

$$H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0 \quad (2)$$

Upon confirming the presence of long run cointegration, we estimated Equation (3) based on the ARDL approach to scrutinize the long run relationship between the variables:

$$\begin{aligned}\Delta InLTA_t = {} & \alpha_0 + \sum_{i=1}^{P}\alpha_1 \Delta InLTA_{t-i} + \sum_{t=1}^{P}\alpha_2 \Delta InLGDP_{t-i} \\ & + \sum_{t=1}^{P}\alpha_3 \Delta InLEXC_{t-i} + \sum_{t=1}^{P}\alpha_4 \Delta InLPS_{t-i} \\ & + \sum_{t=1}^{P}\alpha_5 \Delta InLCO2_{t-i} + \lambda_1 InLTA_{t-1} + \lambda_2 InLGDP_{t-1} \\ & + \lambda_3 InLEXC_{t-1} + \lambda_4 InLPS_{t-1} + \lambda_5 InLCO2_{t-1} + \varepsilon_t\end{aligned} \quad (3)$$

All variables are in their logarithmic form. LTA refers to the number of international tourist arrivals; LGDP proxies gross domestic product; LEXC is the exchange rate; LPS denotes political stability; and LCO_2 refers to carbon emissions in South Africa. After the long run relationship is identified, then we will examine the short run causality and the speed adjustment of the model. Table 1 shows the descriptive statistics result of the tourism model for South Africa.

4. RESULTS AND DISCUSSION

Table 2 reports the empirical result of ARDL bounds testing. The estimated *F*-statistic value (21.47) is larger than the upper bound critical values suggested by both Pesaran et al. (2001) and Narayan (2005) at all different significance levels. Thus, the findings confirmed that a long run cointegration exists between tourist arrivals and its selected explanatory variables.

Table 3 shows the empirical findings of the long run relationship estimated by the ARDL model (1, 2, 3, 2, 3) in this study. The empirical findings showed that LCO_2 has a significant and adverse relationship with LTA, denoting that escalation in carbon dioxide emissions reduce the tourist arrivals in South Africa. Undeniably, the development of tourism industry directly or indirectly contributes to the carbon emissions, especially the airline and accommodation industry.

Table 1: Descriptive statistics

Indicator	LTA	LGDP	LEXC	LPS	LCO_2
Mean	0.86	11.37	2.39	−1.39	0.77
Median	0.87	11.37	2.48	−1.356	0.76
Max.	0.96	11.56	2.75	−0.87	0.85
Min.	0.67	11.07	1.87	−2.37	0.69
Std. Dev.	0.09	0.13	0.28	0.44	0.04
Skewness	−0.54	−0.88	−0.45	−0.72	0.09
Jarque-Bera	3.20	5.47	3.75	3.82	2.07

Table 2: Bound test results

Significance level	Pesaran critical values		Narayan critical values	
	Lower bound	Upper bound	Lower bound	Upper bound
90%	2.43	3.40	2.66	3.84
95%	2.89	4.00	3.20	4.54
99%	3.97	5.46	4.43	6.25
F-statistics	21.47 (k=4)			

Table 3: ARDL and diagnostic tests results

LTA	
Constant	−1.87 (0.15)
LGDP	0.32 (0.00)***
LEXC	0.16 (0.03)**
LPS	0.10 (0.00)***
LCO2	−1.54 (0.00)***
ECT	−0.50 (0.00)***
Diagnostic tests	
χ^2_{Norm}	0.63 (0.73)
χ^2_{Auto} (2)	2.35 (0.31)
χ^2_{ARCH} (1)	0.94 (0.33)
χ^2_{RESET} (1)	0.09 (0.76)
CUSUM	Stable
CUSUM^2	Stable

Asterisks (***) and (**) denote the rejection of null hypothesis at 1% and 5% significance level, respectively. χ^2_{Norm} tests for normality using the Jargue-Bera statistic, χ^2_{Auto} (2) detects correlation error using the Jargue-Bera statistic. χ^2_{ARCH} (1) is the ARCH effect for heteroskedasticity and χ^2_{RESET} (1) refers to Ramsey RESET specification test. CUSUM and CUSUM^2 refer to CUSUM and CUSUM of squares stability tests

Despite the significant contribution of the South African tourism, its hotter and drier climate accelerates desertification and drought crisis. The fact that the average annual temperature is at least 1.5 times higher than the rise in global average temperatures of 0.65°C can threaten the tourism industry. The empirical finding shows that a 1% rise in carbon emissions reduces tourist arrivals in South Africa by 1.54%. Thus, the finding proved that climate disruption is threatening the sustainable growth of the South African tourism.

Meanwhile, a positive and significant relationship have been identified between tourist arrivals and LGDP, LPS as well as LEXC (Table 3). The positive association of GDP on tourist arrivals implies that a 1% growth in GDP of South Africa will lead to an increase in tourist arrivals by 0.32%, indicating that the economic growth can support tourism expansion. Our finding is also in line with Tugcu (2014) and Jong et al. (2020). With higher economic growth, the government has extra budget to inject into the tourism industry that will further stimulate its development. Oh (2005) and Payne and Mervar (2010) have also reported on the economic-driven tourism growth in South Africa. Besides that, political stability also plays a crucial role in ensuring tourism sustainability since it affects the safety and security of the tourists. The empirical outcome showed that, when political stability strengthens by 1%, it upsurges tourist arrivals by 0.10%. These findings advocate that the government can strengthen the tourism industry's contribution to the economy through enhanced economic growth and political stability in South Africa.

In addition, exchange rate also playing the crucial role in influencing tourist's travel decision. The appreciation of the origin currency makes international tourism expenditure less expensive, and thus increase the tourists' purchasing power. This motivates them to travel abroad. The empirical outcome showed that the number of tourist arrivals increases by 0.16% in South Africa when the currency appreciates by 1%. The speed of adjustment to long run equilibrium after an economic shock, as presented by ECT with a value of −0.50, implies that the model adjusts by 50% in each quarter. This indicates that the tourism industry needs two quarters convergence to long run equilibrium after an economic shock occurred in South Africa. Lastly, Table 3 shows that the model has passed all diagnostic tests. This indicates that the empirical model is satisfactory in terms of goodness of fit, and the estimated residuals are normally distributed, well specified, and free from serial correlation. In addition, the model is stable as evidenced by the CUSUM and CUSUM of squares stability tests.

5. CONCLUSION

Many countries have begun to pay considerable attention to climate change and its implications to the sustainability of the tourism sector. Climate change and carbon emissions are profound challenges, but also represent a remarkable opportunity for us to further expand the development of renewable energy that promote energy efficiency and minimize GHG emissions. Ultimately, the tourism industry needs to comply with the new policies and regulations implemented by the governments as well as the 2030 Agenda for Sustainable Development implemented by the UN members.

This study has been conducted based on the "Triple Bottom Line" framework to identify the linkage of tourism sustainability with the fundamental pillars towards the equal harmony within environment, social and economic factors, and thus the sustainability can be achieved accordingly in South Africa. The ARDL cointegration technique was employed to investigate the dynamic relationship amongst the variables in affecting tourist arrivals in South Africa. Our empirical findings proved that economic growth, exchange rate, political stability and carbon emission significantly affect tourist arrivals in South Africa. A positive relationship has been identified between tourist arrivals with economic growth, political stability and exchange rate while carbon emission adversely impacts the tourism industry in South African.

The South African tourism can be greatly affected by the global warming due to its higher increase in mean temperature as compared to the global mean temperature. However, with favourable policies in place that promote both sustainability and tourism expansion, a harmony among environment, social, and economic factors is achievable in the long run. Further research in this field should address the decoupling of adverse carbon emissions on the tourism sector to encourage development efforts that promote sustainability. It is crucial for the tourism practitioners and policy makers to improve the economic efficiency by paying more attention on the carbon dioxide emissions to balance the tourism development and environmental protection for long term sustainable growth for the South African tourism.

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