



## Research article

## The impact of tourism arrivals, tourism receipts and renewable energy consumption on quality of life: A panel study of Southern African region

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## ABSTRACT

Improving wellbeing and livelihoods exemplify the third Sustainable Development Goal. Literature related to the tourism-renewable energy-quality of life nexus is limited and lacks consensus. This study contributes to the debate and examines the influence of international tourism arrival (TA), real international tourism receipts (TR), and renewable energy consumption (REC) on quality of life (QoL) by using a panel of 8 Southern African countries spanning 1995–2017. The results found a significant positive and long-run relationship between TA, TR, and QoL. A significant negative effect was found between REC, trade openness (TO), and QoL while urbanization (Urb) had an insignificant negative impact on QoL. A unidirectional causal relationship was found running from QoL to TR and bidirectional causality between QoL and REC. Feedback causality was found between QoL and Urb and unidirectional causality from QoL to TO. The results imply that tourism is an effective economic tool for improving human development in Southern Africa.

## 1. Introduction

Tourism advances the quality of life (QoL) of the destination country ranging from job creation, income generation, increased vehicular movements, and warm reception and services from the receiving country's citizens (Uysal et al. 2012). According to a United Nations report, the past four decades has experienced an overwhelming increment in the number of travellers who purposely go to other countries other than their country of origin for tourism purposes (United Nations Environment Program, 2011). The share of tourism to the global GDP is very significant, by contributing a greater proportion of aggregate exports and investments. Growth and development in the tourism sector culminated in the increased demand for energy consumption. Currently, the market output of tourism even exceeds that of oil transfers, food items, or cars and trucks: 9% of GDP; 1/11 employment, specific, indirect, and triggered; 6% of the global transfers; 1.4 trillion in exports; 30% of services exports (UNWTO, 2014). Their cultural, social, and political value is moving through a period of strong global development: international tourist arrivals rose by 5% in 2013 to 1.087 billion. International tourism produced US\$ 1.4 trillion in export incomes in 2013. Thus, UNWTO predicts a rise of between 4% and 4.5% in international tourist arrivals (Chancellor et al. 2011). This has become a concern, owing to its impact

on environmental pollution due to increased level of fossil fuel demand and energy intensity (Katircioglu, 2014). Hence, the need to resort to an energy-efficient source such as renewable energy which will provide environmentally friendly effects thereby improving QoL.

Nevertheless, efficient energy production, investment, and renewable energy connected to the tourism division have not yielded benefits (Ridderstaat, 2016). It is reported that Tourists are willing to pay for activities that are likely to promote environmental quality (United Nations Environment Program, 2011). The subject of quality of life includes any aspect of human existence that influence the standard of living (Stiglitz et al. 2009). Much of the focus in the existing literature on QoL has paid much attention in trying to only measure the constructs that are characterized by it but fail to consider pertinent economic issues associated with it such as tourism (Sirgy, 2011). However, some scholar has mentioned that there are some characteristics including circumstances and possessions which are regarded to be self-determining of an individual's knowledge (Ridderstaat, 2016). Some have also attached subjectivity in emotional feelings and how people perceive life to be as a measure of QoL.

It is therefore imperative to examine the effect of clean power utilization, tourism arrivals, and tourism receipts on QoL. Having a full comprehension of the causality of the linkages between the variables will

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provide a great platform for policy direction in the development agenda towards improving quality of life and well-being rather than focusing only on areas related to income generation. It will also be relevant for policymakers to develop the right strategy mix to attain and sustain QoL in a destination country. To the best of our knowledge, except for Ridderstaat (2016) on the linkages amongst tourism development and QoL in Aruba, Croes et al. (2018) on the connection regarding QoL, tourism specialization, and economic development in Malta and Pasten and Santamarina (2012) on the nexus of energy and QoL, no other literature examines the impact of tourism and renewable energy on the quality of life. Second, the few existing studies fail to pay attention to the southern African region, a vibrant tourism industry that provides a huge contribution to growth and development. Third, the majority of the extant literature is concentrated on the energy-QoL nexus but we decompose the energy mix and examine renewable energy-QoL relationship vis-à-vis tourism. This examination seeks to fill this gap by examining the effect of tourism arrivals, tourism receipts by the destination country, and clean power utilization on standard of living in Southern African countries within sub-Saharan utilizing more recent data from 1995-2017.

A plethora of existing studies on tourism and QoL (Ridderstaat, Croes & Nijkamp 2016a; Croes, 2012a, 2012b; Chancellor et al., 2011) define QoL as the ultimate reason for the development of tourism. The studies argue that tourism expansion has a substantial effect on QoL whether direct or indirect involvement in the tourism sector (Chancellor et al., 2011; Kim et al., 2013). The connection regarding tourism and quality of life could be categorized into two perspectives. The first school of thought equates quality of life with growth in terms of income generation, thus, wealth drives the quality of life (Croes et al., 2011; Kenny, 2005). The second school of thought recognizes the unidimensional hypothesis of QoL, arguing that quality of life is subjective (Sen, 1999). The social exchange theorist opines that the effect of tourism on QoL is always vied by community residents as one that should be able to change their lives and better their living standards (Andereck and Nyaupane, 2011; Andereck et al., 2007; Ap, 1992; Figini and Vici, 2010; Perdue et al., 1991). They may express 2 key complaints against the second party. The central dimension of the contextual approach seems irreconcilable with the clear choices and learning opportunity of the person and is much more closely linked to the circumstances and happiness of others instead of balancing out their expectations for life (Kahneman and Krueger, 2006). That is, when persons adjust the conditions of living circumstances in addition to perceptions, people can assume that their circumstance is good (Ridderstaat, Croes & Nijkamp, 2016a,b; Sen, 1999). The focus of these studies refers to a single point in time, so it does not recognize the short-run and long-run outcome of tourism on QoL.

Energy is needed to maintain and enhance the standard of living. The rapid change in society and the six-fold raised residents since industrialization demands huge quantities of energy supplied predominantly by coal and petroleum (Hall et al., 2003). Further population increase and quality of life improvements will increase the demand for fossil fuels in the immediate future and exacerbate the related environmental consequences (IPCC, 2007; Lee, 2011).

Meanwhile, the heavy fossil fuel usage rate is accelerating environmental degradation (Bentley et al. 2007). The caveat is that about two-thirds of countries that produce oil have already exhausted their highest production levels due to technology willingness and financial returns on investment. This hampers the advancement of anti-conventional energy sources (Arent et al. 2011; Resch et al., 2008) and hydroelectric capacity is almost inundated (IEA, 2010). The energy-quality of life debate has raised concerns for energy investments in renewable energy sources. This has been high on the agenda of many governments given its effectiveness in engendering clean environment and positive impact on the quality of life (REN21, 2011; Glaser, 2011).

There is a high association between power utilization and many indices of QoL (Pasten and Santamarina, 2012). In terms of current technological advancement, the proportion of the world's population that consumes renewable energy to improve QoL stands at less than 44%.

Hitherto, it is not far-fetched that emerging economies could still go ahead and attain appreciable levels of quality of life with little dependency on energy consumption (Pasten and Santamarina, 2012). The total number of people worldwide whose daily life is energy driven is very insignificant and this accounts for 5kW per person, 49% of the aggregate global energy demand. The argument has long stood that any form of energy consumption is not a determinant of improved QoL especially in developing economies. Nevertheless, some countries in the developing economies have resorted to reduced energy consumption and this has led to an improvement in QoL (Pasten and Santamarina, 2012; Herring, 2006). This means that a little increase in energy consumption in countries whose energy demand levels are not so high would improve QoL.

On the other hand, Ertay et al. (2013) posit that dependency on renewable energy is a remedy for sustainable development in health and economics. It is argued that renewables are a clean energy source that improves environmental quality, hence, reducing harmful health complications due to environmental pollution. It is reported that the population in low-income economies either consume very little renewable energy source or inefficiently apply energy thereby affecting their standard of living (Martin, 1980). Poor countries could utilize energy to improve economic growth through the benefits of agricultural produce per unit of energy input (Alam et al., 1991). Given this, the returns from farming activities will be significant enough to advance the standard of living as a result of increased income generation. It is further argued that villages who can take advantage of increased renewable energy demand will be able to utilize irrigation sources for farming, mechanized construction projects, mixed-cropping, modernize road constructions and improve QoL (Sarkodie et al., 2019). Developed economies are increasing agricultural growth and development through increased energy consumption that yields a high standard of living. The amount of per capita clean power utilization is a significant indicator of living standards or QoL of a group of people. This is more prevalent in countries with modern technology in energy production and consumption (IEA, 2010).

## 2. Literature

Existing research on quality of life and tourism place emphasis on only one-sided relationship, in which tourism arrivals and receipts have significant effects on quality of life. Andereck and Vogt (2000) investigated the connection amongst inhabitants' behavior towards leisure industry and their backing in favour of particular tourism choices such as parks, eco-tourism facilities, and cafes. The authors concluded that tourism can have a positive effect on a community's QoL, which is a wider unit of measurement than the person-level quality of life. Previous studies posit that tourism affects the QoL of any citizen or society at large (Andereck and Vogt, 2000; Fredline, 2005; Sdrali and Chazapi, 2007; Gjerard, 2005; Andereck et al., 2007; Marzuki, 2009; Andereck and Nyaupane, 2011). There is an implied suggestion in this case that QoL may be more than just tourism as a development product.

Croes (2012b) examined the association between tourism and QoL in the Nicaraguan and Costa Rican economies and found a two-sided correlation between tourism and QoL in the context of the Nicaraguan economy, but not same with the Costa Rican system. Per the account, the separate results could be attributable to tourism's potential where it constantly influences the QoL of the nationals of destination countries. Concerning Nicaragua, tourism development is found to improve residents' QoL. This includes service enhancements to the advantage of tourism, thereby enabling a two-way relation to develop amongst the standard of living and tourism arrivals and tourism receipts. But there is a diminishing effect from tourism on QoL in the case of Costa Rica.

In contrast, tourism is found to have no significant relationship with QoL (Algieri, 2006; Croes, 2011). According to Algieri (2006), tourism specialization is not a precursor for improved human development. Ridderstaat et al. (2014) proofed that tourism has no consistent direct impact on the quality of life, given the absence to establish long-term

tourism effort that improves standards of living. The results could be interpreted to mean that tourism might not contribute to long-changes in all dimensions of an individual's QoL in the case of Aruba.

On the other, wages, wellbeing, and literacy could be improved in later years (Ridderstaat, Croes & Nijkamp, 2016a). Besides, Ranis et al. (2000) found that an increase in tourism specialization leads to complexities and sophistications in the tourism sector requiring high levels of knowledge to provide the required services. These processes could eventually boost the quality of life through tourism-led economic development. Ridderstaat et al. (2016b) found that tourism has a positive and significant impact on QoL in the short-run. The education segment of the economy stands to benefit greatly from tourism activities since tourism has a positive impact on QoL in both short and long-runs (Biagi et al., 2015). On the other hand, Ridderstaat et al. (2016b) found nonlinear and bidirectional dynamic relations between tourism and QoL in the short-term.

Moreover, tourism is one of the driving forces of both economic growth and environmental sustainability, hence, the interaction between pollution and renewable energy consumption needs further attention. Katircioglu (2009a,b) studied the long-term association between global tourism and real GDP in Turkey and found no long-term equilibrium connection regarding tourist parameters and economic growth. According to Katircioglu (2014), the growth of Turkey's tourism operations has contributed to the rise in both energy use and global warming. Katircioglu et al. (2014) examined the long-term relationship between international tourism, energy utilization, and pollutant pollution in the context of Cyprus. The study found a significant and measurable impact on the global tourist arrivals. The magnitude of the effects of tourism on both energy usage and carbon dioxide pollution was significant. Jebli et al. (2019) identified a feedback causal relationship regarding clean power utilization in addition to tourism, implying that the two variables have a robust relationship amongst themselves in the long-run.

A study Jebli et al. (2015) identified one-way causality from clean energy consumption to global tourism and bidirectional causality between sustainable development, CO<sub>2</sub> emissions, clean energy utilization, and international tourism. Their results imply that clean power utilization leads to increased tourism receipts and arrivals which increases CO<sub>2</sub> emissions in the long term. Examining the interlinkages between renewable energy, CO<sub>2</sub> emissions, economic growth, and trade, Jebli et al. (2014) established a long-run connection regarding tourist arrivals and renewable energy usage, affirming the contribution of both in ensuring a clean environment. Renewable energy sources were found to increase tourist activities in Nepal (2008). Again, Lee & Brahmarsene (2013) found that renewable energy consumption was not favourable for the EU countries because tourism was negatively affecting the climate through increased emissions.

Many of the existing literature on the energy-QoL nexus lack consensus. Alam et al. (1991) found a high correlation between energy consumption and QoL. A higher level of energy per capita consumption was found to increase life expectancy, reduce infant mortality, and increase literacy rates. The results showed a very high relationship between physical QoL indicators and energy consumption from clean sources. The study further supported the argument that communities in developing countries are poor due to very little dependency on energy, particularly in agricultural activities. Besides, Reville (1980) argued that the inefficient way through which people living in rural communities use energy has contributed much to their poverty levels and bad economic outlook. According to Rahman and Huq (1980), the economic conditions of a country are greatly correlated with energy consumption. As a country relies much on energy and consumes high levels, economic conditions improve due to access to electricity and industrialization thereby improving the standards of living (Sarkodie & Adams, 2020a, 2020b). The so-called first economies have relied greatly on the consumption of clean energy to advance their course in increasing the standard of living. This is because the majority of the population in these developed economies have access to electricity, which an important social amenity is

serving as a factor that determines life necessities in today's world (Friedlander, 1974; Dalal, 1973). Consumption of renewable energy is a very important source of the energy mix, as it has very little or no emissions that affect health outcomes. For this reason, energy consumption from geothermal and wind, for example, Biogas is reported by Alam et al. (1991) as a critical source of energy that enables households in emerging countries to have access to energy for cooking. They reported that this has contributed to improving quality of life, by increasing life expectancy rate due to a decline in household pollution. Sustainable development and clean power utilization are precursors for improving the standard of living and enhancing human development (Smil and Knowland, 1980).

### 3. Methodology and data

#### 3.1. Data

Our data utilized in this paper for 11 Southern African countries span 1995–2017. Variables obtained include the total quantity of tourist arrivals (TA), total tourist receipts (TR) in destination countries measured in current US\$, renewable energy consumption (REC) is measured as the share of final energy consumption, quality of life (QoL), trade openness (TO) is the total imports in addition to exports as a percentage of GDP and urban population (Urb) is the percentage of the total population in the urban areas. QoL is measured with the human development indicators which include life expectancy. Other aspects include access to knowledge by measuring it through the education system. The measurement of the mean standard of living involves the purchasing power of the people. This index is measured on a scale between 0 to 1. Data for renewable energy were sourced from sustainable energy for all (SE4ALL) database. All the other variables were sourced from the World Bank's World Development Indicators (WDI). To allow analysis in the elasticities form, the variables were converted into their natural logarithm. Doing this we were able to interpret the results in a way that captured long term growth impact of the regressors on the dependent variable, QoL.

#### 3.2. Conceptual framework

There are many ways that QoL could be operationalized into a uni-dimension or a multi-dimension manner when considering total life satisfaction (Ryff and Keyes, 1995). Other ways of measuring QoL is subject to either material possessions or non-material possessions that define human existence and determine their being (Easterlin and Angelescu, 2012; Stiglitz et al. 2009). According to Stiglitz et al. (2009) thus, QoL could be examined from an objective or subjective perspective. The objective perspective entails basic needs such as food and clothing, source of income, and capacity to live. The subjective perspective considers factors that a person assumes as a source of self-happiness or provides satisfaction that allows the individual to function (Ridderstaat et al. 2016a).

Critiques of the subjective perspective contend that frame of mind and sentiments are a mental evaluation of a condition that is deemed to be objective but not the condition as a whole. The argument here is that people adapt well to the society they find themselves in and that the environment within which they live tend to shape their feelings and thoughts. So with regards to accepting a level of satisfaction highly depends on the situation they find themselves at every point in time (Jebli et al., 2015). It is, therefore, dangerous to assume that policy direction could be formulated based on such adaptation as it could have serious ramifications (Dogan and Aslan 2017).

Recognizing the essential criteria that may cause QoL, as well as recognizing how these criteria apply to tourism differentiation, is a key step in reconfiguring practical growth options for small island destinations (Liburd et al., 2012). Having a deeper understanding of the dynamics of the objective indicators with potential influence on QoL and evaluating its impact on tourism and renewable energy consumption is

important in standardizing representative developmental alternatives for the southern African region. This study utilizes the human development indicators which include life expectancy, average years of schooling, and standard of living to conceptualize QoL.

Clean power is the percentage of renewable power in final power utilization. Standard of living measures the aggregate nationwide earnings per capita of a country. According to [Katircioglu \(2009b\)](#), there are different ways of examining tourism variables which involve tourism receipts, the number of nights spent by visitors from overseas, and the total number of international tourist arrivals. This study uses the total number of tourist arrivals and total receipts in the destination nations. The number of tourist arrivals is the total number of visitors who arrive in a destination country other than any other activity for remuneration within the visited country. Total tourism receipts are the expenses on goods and services made by visitors who travel to a destination country for tourism purposes. This variable is measured in current United States dollars. Variables for tourism were obtained from the World Tourism Organization database.

The influence of tourism arrivals, real tourism receipts, and sustainable power utilization on standard of living was examined alongside two other controlling variables, trade openness and urban population. This implies that the relationship under consideration is in a multivariate form, thus, including predictors exceeding one. The long term relationships were expressed as logarithms — where the coefficient of the estimations are in elasticities. First, to ensure that variables for this study are stationary, we estimated the stationarity test using four different techniques including [Levin et al. \(2002\)](#), [Im et al W-stat \(2003\)](#), [Dickey & Fuller test \(1981\)](#), and the [Phillip & Peron test \(1988\)](#).

Next, we undertook the test of cointegration to identify the presence of cross-dependency and a long-run equilibrium connection regarding the variables under consideration. We utilized a [Kao cointegration test \(1999\)](#) and [Pedroni cointegration \(2004\)](#) tests to found the possibility of a long-term equilibrium association.

We employed three different techniques namely autoregressive distributed lag model (ARDL), fully modified ordinary least squares (FMOLS) ([Phillips, 1995](#)), and dynamic ordinary least squares (DOLS) ([Stock and Watson, 1993](#)) to estimate the long and short-run connections regarding the control variables and the dependent variables. The ARDL approach for the estimation of long and short-run relationships is a good way of estimating the cointegration between the variables by selecting the Akaike Information Criterion (AIC) in selecting the maximum lag length of the variables. Besides the F-stat is a reliable estimator for determination of cointegration.

FMOLS is a recent approach that assists in estimating the maximum cointegration equivalence ([An and Jeon, 2006](#)). One characteristic that makes the FMOLS powerful and preferred is its ability to assist in regulating serial correlations and issues of endogeneity in the regressors emanating from the cointegration relationship by transforming the ordinary least squares (OLS) ([Hansen, 1995](#); [Phillips and Hansen and Phillips, 1990](#)). The DOLS approach, on the other hand, calculates the criterion variable on the predictor when the levels, lags, and clues of the predictor variable are exhausted. Issues of biases associated with small samples, endogeneity, and serial correlation are taken care of by the DOLS techniques by adding the lags of the predictors ([Sharif and Raza, 2016](#); [Stock and Watson, 1993](#)). These methods were adopted to allow for reliability and robust estimations for unbiased policy directions.

We used the Dumitrescu-Hurlin granger causality test to identify the direction of causalities regarding the study variables ([Dumitrescu and Hurlin, 2012](#)). The standard Granger causality method is different from the approach approved in this examination undertakes varying coefficients across cross-sections. The approach is also applicable in situations where  $T > N$  and  $T < N$  and even in terms of an unbalanced and heterogeneous panel.

### 3.3. Specification of the model

In theory, our study follows [Katircioglu \(2009b\)](#) in specifying the model. Particularly, tourism arrivals and tourism receipts could serve as significant factors for the human development indicators. We measure renewable energy consumption, trade, and urbanization as a driving force for quality of life. Thus, the empirical model of our study examined the impact of international tourism, renewable energy consumption, trade openness, and urbanization on quality of life. The functional relationship between the variables results in the following equation;

$$QoL_{it} = f(TA_{it}, TR_{it}, RE_{it}, TO_{it}, Urb_{it}) \quad (1)$$

However, the general specification of the natural logarithm transformation of [Eq. \(1\)](#) is given as:

$$QoL_{it} = \alpha_0 + \alpha_1 \ln QoL_{it-1} + \alpha_2 \ln TA_{it} + \alpha_3 \ln TR_{it} + \alpha_4 \ln RE_{it} + \alpha_5 \ln TO_{it} + \alpha_6 \ln Urb_{it} + \delta_i + \rho_t + \epsilon_{it} \quad (2)$$

where  $QoL_{it}$  is the quality of life of a country in at a time  $t$ ;  $TA_{it}$  is the international tourist arrivals in a destination county;  $TR_{it}$  is the total real tourism receipts;  $TO_{it}$  represents trade openness;  $Urb_{it}$  is the urban population.  $\delta_i$  and  $\rho_t$  effects presented by a specific country within a specified period related to the variables correspondingly.  $\epsilon_{it}$  denotes the error term of the equation. Parameters to be estimated is denoted by  $\alpha$ .

## 4. Empirical results

We initially determined the correlation between the study variables. The correlation results in [Table 1](#) demonstrate that QoL is negatively ( $p\text{-value} < 0.01$ ) associated with renewable energy consumption. Apart from this observation, all the other independent variables have a positive correlation with the quality of life. The correlation between quality of life and tourism arrivals and quality of life and tourism receipts are significant. The association between trade openness and quality of life is significant but the latter is not significant with urban population. The results also show a negative and significant association between clean power utilization in addition to tourism arrivals, tourism receipts, trade openness, and urban population. Tourism arrivals and tourism receipts are positively and significantly associated with one another. The results show a weak positive correlation between tourism receipts and urbanization but a negative association between urban population and tourism arrivals.

### 4.1. Unit root test

We estimated the unit root test to establish the stationarity of the variables by employing [Levit, Lin & Chu \(2002\)](#), [Im et al. \(2003\)](#), [Augmented Dickey and Fuller \(1981\)](#) and [Philip and Perron \(1988\)](#) techniques. The techniques assume both common and individual unit root processes. The unit root test results displayed in [Table 2](#) shows that all the variables were not stationary at level but stationary at first difference, meaning that the properties of the variables are integrated of order I[1].

### 4.2. Cointegration test results

After ensuring the stationarity of the variables, we proceeded to identify the possibility of long-run equilibrium association between the variables by estimating the cointegration test. We used two different cointegration test approaches for the panel namely [Kao cointegration & Pedroni cointegration tests](#). The trend assumption

**Table 1.** Correlation matrix.

	QoL	REC	TA	TR	TO	Urb
QoL	1.0000					
REC	-0.7453***	1.0000				
TA	0.3194***	-0.4892***	1.0000			
TR	0.5702***	-0.6513***	0.7456***	1.0000		
TO	0.2308***	-0.0885	-0.0390	-0.1675***	1.0000	
Urb	0.1322	-0.1125	-0.1252	0.0381	0.0451	1.0000

Note: \*\*\* stand for 1% significance level.

**Table 2.** Unit root test results.

Variables	Levit, Lin, and Chu	Im et al.	Augmented Dickey-Fuller	Philip-Perron
QoL	-1.8228** [0.0342]	0.58604 [0.7211]	11.2964 [0.7908]	49.6715*** [0.0000]
REC	-4.2329*** [0.0000]	-4.8052*** [0.0000]	51.7233*** [0.0000]	90.3526*** [0.0000]
TA	-4.6734*** [0.0000]	-6.7517*** [0.0000]	70.2745*** [0.0000]	191.007*** [0.0000]
TR	-6.1036*** [0.0000]	-5.82091*** [0.0000]	61.2191*** [0.0000]	104.733*** [0.0000]
TO	-4.5716*** [0.0000]	-3.7272*** [0.0001]	42.3608*** [0.0003]	133.815*** [0.0000]
Urb	-3.3873*** [0.0004]	-6.2787*** [0.0000]	67.3158*** [0.0000]	541.045*** [0.0000]

Note: \*\*, \*\*\* denote 10%, 5% and 1% significance level respectively.

we used was deterministic intercept and trend. Both test results shown in Table 3 indicate that the variables are cointegrated and have possibilities of long-run relationship because the outcome leads to the rejection of the null hypothesis of no cointegration at 1% and 5% significance levels. The Pedroni test results show that out of the seven estimation techniques, 4 of them are significant at 1% and 5% levels while the Kao cointegration approach shows a significance level at 1%.

### 4.3. Long-run relationship

Having established the possibility of a long-run association between tourism arrivals, tourism receipts, renewable energy consumption, and quality of life, we continued to estimate the ARDL estimation to identify the long-run and short-run coefficients. The cointegration association regarding the variables in Southern Africa is reliable with the outcomes of our estimations. The ARDL valuation results in Table 4 proofs that in

**Table 3.** Kao and Pedroni Cointegration test results.

Kao Cointegration test				
	t-Statistic	Probability		
ADF	-2.528976	0.0057***		
Residual variance	0.001851			
HAC variance	0.002189			
Pedroni residual cointegration test				
Alternative hypothesis: common AR coefs. (within-dimension)				
	t-Statistic	Probability	Weighted Statistic	Probability
Panel v-Statistic	-0.763492	0.7774	1.705610	0.0440**
Panel rho-Statistic	1.551318	0.9396	2.382671	0.9914
Panel PP-Statistic	-1.930130	0.0268**	-0.523231	0.3004
Panel ADF-Statistic	-1.985946	0.0235**	-0.285751	0.3875
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho-Statistic	3.338639	0.9996		
Group PP-Statistic	-2.390380	0.0084***		
Group ADF-Statistic	-0.958558	0.1689		

Note: \*, \*\*, \*\*\* denote 10%, 5% and 1% significance level respectively.

**Table 4.** Long-run and short-run equilibrium relationship: ARDL (2,1,1,1) Test Results.

Long-Run Equation			
	Coefficient	t-Statistic	Prob.*
Constant	-0.0856	-1.4037	0.1630
REC	-0.6771	-3.1914	0.0018
TO	-0.2261	-2.8159	0.0057
TR	0.1608	4.1723	0.0001
TA	0.1360	3.6374	0.0004
Urb	-0.0059	-0.2205	0.8258
Short Run Equation			
COINTEQ01	-0.048115	-1.460346	0.0468
D(LREC)	0.012594	0.150293	0.8808
D(LTO)	-0.017883	-0.699078	0.4859
D(LTR)	-0.014017	-1.814088	0.0722
D(LTA)	0.022571	1.134393	0.2589
D(LURB)	-0.022534	-0.423773	0.6725

Note: prob\* represent the p-value.

the long-run both TA and TR have a robust positive relationship with quality of life at 1% significant level in an average Southern African country. On the other hand, REC, TO, and Urb have a significant negative relationship with QoL at 1% level in the long. Ultimately, the results provide that TR has the most significant relationship with QoL in the long-run showing that a percentage change in TR leads to a 0.16% improvement in QoL. This was followed by TA which provided that QoL of the Southern African people will improve by 0.13% with a 1% change in TA. Alternatively, a 1% change in REC leads to a 0.67% decrease in QoL. Besides, a percentage change in TO results in a 0.22% decrease in QoL while a 1% change in Urb leads to a 0.01% reduction in QoL.

#### 4.4. Sensitivity analysis

To check the sensitivity of our long-run equilibrium relationship results, we estimated the FMOLS and the DOLS. Outcomes of the FMOLS and DOLS presented in Table 5 are not different from those produced by the ARDL estimations. Besides, the coefficients are identical across model estimations for the ordinary least square model. In terms of the magnitude of the relationship with the dependent variable, quality of life, the coefficients are similar. The coefficients produced by the two techniques are unbiased (Pedroni, 2004; Kao, 1999). The FMOLS results from Table 5 show that a 1% change in both tourism arrivals and tourism receipts will increase the quality of life by 0.05% and 0.003% respectively. This result is consistent with (Andereck and Vogt, 2000; Fredline, 2005; Sdrali and Chazapi, 2007; Gjerald, 2005; Andereck et al., 2007; Marzuki, 2009; Andereck and Nyaupane, 2011) and in contradiction with some studies (Ridderstaat et al., 2014; Croes, 2012a, 2012b; Algieri, 2006). The results imply that countries have utilized the tourism sector to improve the standard of living. Maybe the population has high literacy levels in science and technology which has consequently boosted

economic advancement through foreign exchange receipts from tourism. Another possibility is that the tourism industry has put in place proper structures to absorb the number of visits and to utilize tourism inflows to impact positively on education and health due to significance in economic growth. But on the other hand, a 1% change in renewable energy consumption, trade openness, and the urban population will reduce the quality of life by 0.49%, 0.10%, and 0.12%, respectively, which consistent with (Ertay et al., 2013) but contrary to (Jebli et al., 2019). Estimates from the DOLS show that a change in tourism arrivals and tourism receipts will increase the quality of life by 0.29% and 0.51% respectively. Also, a 1% change in renewable energy consumption, trade openness, and urban population reduces the quality of life by 0.70%, 0.20%, and 0.46% correspondingly. These results imply that developing countries like the Southern African region cannot rely safely on renewable energy sources to effectively impact human development, thereby improving standards of living. Even though renewable energy sources such as biogas could serve as a significant and important source of energy for households. The results show that emerging economies may not have exploited this source of energy in agriculture and industrial sector to boost production and increase output. Trade has not been liberalized in a manner that seeks to improve human development. International trade in goods and services among the countries and between other international economies has not been efficient enough to boost economic advancement and thereby improve quality of life. Probably there are poor institutional framework and foresight in the area of trade to enable the countries to take advantage of today's open market economy. The percentage of the population living in urban cities does not contribute to improving human development. These results could be inferred that urban centres are developed without proper planning to provide adequate social amenities and services.

**Table 5.** Robustness check of long-run relationship with QoL: FMOLS and DOLS results.

Variables	FMOLS			DOLS		
	Coefficient	t-Statistic	Prob.	Coefficient	t-Statistic	Prob.
REC	-0.4971	-11.5751	0.0000	-0.704990	-1.38E+09	0.0000
TA	0.0598	2.4463	0.0155	0.296931	2.46E+09	0.0000
TR	0.0034	0.2650	0.7913	0.517971	3.78E+09	0.0000
TO	-0.1031	-3.0192	0.0029	-0.203877	-1.76E+09	0.0000
URB	-0.1241	-2.3781	0.0185	-0.464915	-1.77E+09	0.0000

Note: prob represents the p-value; FMOLS is fully modified ordinary least square; DOLS is dynamic ordinary least square.

#### 4.5. Dumitrescu-Hurlin granger causality test findings

After confirming the long-run relationship and reporting the outcome, it was very relevant to establish the causal relationship between QoL, REC, TA, TR, TO, and Urb. This was important because it serves as a guide for policy. The estimation output shows in Table 6 that there is a two-way causality between QoL and RE, between QoL and Urb, and between TA and TO consistent with (Dogan et al., 2017; Ritchie and Crouch, 2003). We established a one-way causal relationship running from QoL to TR (Croes et al., 2011), from QoL to TO, from TA to REC, from TA to TR, and from TR to Urb. It is worthy to note that the estimation showed no causal relationship between TA and QoL. All results for the causal relationship in Table 6 are statistically significant. The observation of a two-way directional causality between QoL and REC implies that the agenda of the African states to ensure the decomposition of the energy mix of fossil fuel energy, gas, and oil from QoL is progressively positive as renewable energy consumption is a driving force for QoL. Again, QoL drives TR in a one-way direction in the southern African region. The results imply a negative impact on human development as a result of uncontrolled tourism arrival for the Southern African economies which have tried to achieve substantial level strides in the tourism sector. The significant evidence of Granger causality for TR with QoL means that real tourism receipts in a destination country will lead to increased foreign exchange earnings which will ensure growth and development leading to improve the standard of living of the people. Through tourism, the countries stand the chance of receiving foreign exchange earnings by way of demand for goods and services from visitors, which eventually leads to an improved standard of living in the destination country. This is a precursor for earnings for the domestic citizens coming from accommodation, feeding, and entertainment, just to mention a few (Jebli et al., 2014).

#### 5. Conclusion and policy implications

This study empirically investigated the impact of tourism arrivals, tourism receipts and renewable energy consumption, trade openness, and urbanization on quality of life for a panel of 8 Southern African countries utilizing currently available panel data from 1995-2017. Primarily, the paper aimed to examine the effects of tourist arrivals and tourism receipts on human development given that renewable energy is deemed to be the primary energy source of production in the region. We employed different panel cointegration techniques which confirmed the existence of a long-run relationship across the variables. Results of the long-run equilibrium relationship between the variables from both ARDL, FMOLS, and DOLS showed a statistically and positive long-run relationship between tourism arrivals, tourism receipts, and quality of life. This means that in the long-run the tourism sector has the potential of improving human development. Undeniably, any upsurge in tourism arrivals and tourism receipts will increase the level of human development. However, the opposite was found when Ridderstaat et al. (2014) investigated the impact of tourism development on the quality of life on the small island of Aruba. The study results were attributable to the inability of the tourism industry to cause improvements in quality of life. This clearly shows that the results of this current study support the assertion that tourism in the Southern African region is capable of improving all the ingredients involved in quality of life.

Tourism enhances health and long life, improves literacy rates, and contributes to economic growth by improving standards of living. This suggests that the concentration of the development agenda should not only be based on increasing individual incomes but the provision of social services including health care and access to knowledge acquisition. This plays a critical role in welfare and subjective wellbeing which can empower people's developmental agenda (Stiglitz et al., 2009). Another policy implication is that improving quality of life is important but this should go beyond education and health. The policy directions on tourism should be able to be adjusted in such a way that it could effectively

impact positively and significantly on the quality of life of the destination countries. There should be policy direction that ensures sound human capital enrichment for the domestic citizens so that they would be more competitive with immigrants.

Given that tourist arrivals and real tourism receipts lead to a long-run relationship, governments in the region should ensure that the AU social policy framework CAMSD/EXP/4(I), as well as the AU/NEPAD Tourism Action Plan (TAP), is vigorously pursued. So that the objectives therein would be achieved to their benefit of improving quality of life of their people. Immigration procedures should be relaxed for people to get access to travel to countries of interest to visit. One important aspect of the economy that could encourage tourism in destination countries is security. It is therefore incumbent on governments of these countries to put in proper security measures that would ensure the safety and protection of visitors at all times. Lessons could be learned from the South African case where xenophobia took a centre stage and deterred prospective tourists into the country.

The long-run relationship showed a significant negative relationship between renewable energy consumption and quality of life. Meanwhile, the causality results showed a two-way relationship between renewable energy consumption and quality of life. These results imply that this region does not conform to the energy targets set out, for instance, the Kyoto Protocol and the Paris agreement which are all aimed at reducing the global mean temperature below 2 °C. The caution here for policymakers is that timely and careful steps must be taken in the energy policy direction to have the right energy mix that would impact the living standards (Aloola et al., 2019; Emir and Bekun, 2019). Technological advancement in an unpolluted energy source like photovoltaic panels and mini-wind generators could be used to integrate the energy distribution grid. Energy policy direction could heavily rely on the utilization of poly generation systems in micro-power generation in the business and public sectors.

According to the International Renewable Energy Agency, about 40% of the residents of the African continent are concentrated in rural communities which presents the opportunity for them to benefit from inclusive methodologies in energy development (IRENA, 2014). Sectors such as health, education, agriculture, water, and telecommunications can take advantage of these processes. In this regard, the southern African countries should pay particular attention to the provisions spelled out in the Paris Agreement, thus, COP21 whose purpose to vigorously pursue the agenda of adding 300GW of fresh renewable electricity capacity in the African continent by the year 2030. This point is very vital for energy stakeholders and policymakers in this region as a result of the negative impact of renewable energy consumption on quality of life. There is the need to decompose the renewable energy sources and come to the terms that improve human lives and development.

Even though the roadmap for renewable energy consumption for the year 2030 in the continent demand some US\$70 billion every year, this could be possible when governments of the continent commit themselves to the course by reducing corrupt practices and a great amount of political willingness and ambition to achieve the fate (UNECA, 2018). Another important thing is for countries to open up doors for the private sector to invest in the energy sector which is a good mechanism for reducing the financial and other resource burdens of government. A conducive financing environment is required for private sector investment and inclusion in this area. All these put together is a good fight towards the achievement of the sustainable development goal (SDG) 7 for a cleaner environment which will impact positively on human development.

In terms of trade openness and urbanization, the results of this study showed a negative impact on the quality of life. The results imply that trade policies in the region are not conducive enough to engender growth and development. It is incumbent on governments to initiate appropriate effective international trade policies that would go a long way to welcome foreign direct investment in goods and services in the region. There is the need to liberalize trade policies that will open up the window

**Table 6.** Results for Dumitrescu-Hurlin Panel directional causality relationships.

Hypothesis	W-Stat.	Zbar-Stat.	Prob.
REC → HDI	4.06885	1.9109	0.0560
HDI → REC	3.98615	1.8222	0.0684
TR → HDI	6.14831	4.1393	3.E-05
HDI → TR	4.53880	2.4145	0.0158
URB → HDI	4.02942	1.8400	0.0658
HDI → URB	5.90948	3.8351	0.0001
TO → TA	3.86979	1.6975	0.0896
TA → TO	5.60857	3.56094	0.0004
TA → REC	5.07806	2.99242	0.0028
REC → TA	3.67024	1.48373	0.1379
TA → HDI	6.08277	4.06913	5.E-05
HDI → TA	3.41037	1.20524	0.2281
TO → HDI	2.89096	0.64861	0.5166
HDI → TO	5.20934	3.13311	0.0017
TR → TA	3.18622	0.96503	0.3345
TA → TR	5.17368	3.09489	0.0020
URB → TR	7.13169	5.13218	3.E-07
TR → URB	4.13903	1.95639	0.0504

Note: → denote the direction of causality; prob is the p-value.

of opportunity for international investments and even for the local citizens to invest in the economy. This will ensure job creation that results in employment for the people. The findings of the negative relationship between urbanization and quality of life do not agree with the modernization debate that urbanization positively impacts education and related aspects of society. The results indicate that maybe the urban population could have a great negative impact on the school environment affecting the rate of literacy of the population. Again, there could also be the existence of inadequate urban amenities that hampers on growth and development. Since education, health, and income enhance the quality of life, the availability of educational facilities and health facilities in urban cities are preconditions for improved maternal and child health.

## Declarations

### Author contribution statement

Steve Yaw Sarpong: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Murad A. Bein: Analyzed and interpreted the data; Wrote the paper.

Bright Akwasi Gyamfi: Analyzed and interpreted the data; Wrote the paper.

Samuel Asumadu Sarkodie: Analyzed and interpreted the data; Wrote the paper.

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