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The Role of Renewable Energy in the Development of the Tourism Sector

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Abstract

The aim of this study is to investigate the relationship between tourism and renewable energy. In the study, the economies of Egypt, Kenya, and Ethiopia, which are in the African continent and lead renewable energy in this continent, were analyzed with the Granger causality test. As a result of the causality analysis, a positive and significant relationship was found between the number of tourists coming to the country in Egypt and the renewable energy consumption of this country. In addition, it has been concluded that Egypt's earnings from the tourism sector also affect the renewable energy of this country. In terms of Kenya, although there is no significant relationship in terms of renewable energy, a significant relationship was found between the income obtained from the tourism sector of the country and the number of tourists. In terms of Ethiopia, no causal relationship has been determined. In the absence of a meaningful relationship between renewable energy and tourism, it can be stated that the tourists who come to the country do not care about environmental pollution in terms of energy. In other words, the inclusion of renewable energy in investments in the tourism sector in these countries will not affect the number of tourists.

Keywords: Renewable energy; tourism; Egypt; Kenya; Ethiopia

Introduction

The increasing importance of renewable energy in the service sector and especially in the tourism industry has become a new research topic. The relationship between the tourism sector and renewable energy is one of the most studied topics in the literature. Hotel Energy Solutions (2011) also estimates that a typical hotel emits between 160 and –200 kg of CO^2 per m^2 of room floor area per year, depending on the type of fuel used to generate energy. Renewable energy, of course, plays an important role in tourism in many ways, especially in issues such as energy efficiency, sustainability and cost reduction (Ásványi et al., 2017). However, as Wies et al. (2005) pointed out, using renewable energy sources in remote locations can help reduce operating cost by reducing fuel consumption, increasing system efficiency and reducing noise and emissions.

To examine the connection between the expansion of tourism and renewable energy, a model has been created. It has been examined, specifically, how energy use by travelers to Egypt, Kenya, and Ethiopia relates to renewable energy sources. Studies that highlight the fact that human energy usage comes from renewable sources rather than depleting ones are shamed in the literature. The usage of renewable energy in tourist sites, particularly hotels, has also been the subject of research in the literature (Ásványi et al., 2017; Cheung & Fan, 2013; Chou, 2014). From this perspective, determining whether there is a connection between the tourist industry and renewable energy is crucial. States are now competing to develop their own renewable energy sources, rather than relying on existing energy sources. Many countries are now able to meet their domestic energy needs by benefiting from the benefits of renewable

energy (Huseynli & Huseynli, 2022). According to Chan and Wong (2006) and Mensah (2006), hotels run on three types of energy: electricity, gas and diesel. Electricity is considered the main type of energy used in hotels compared to gas, diesel and coal (Zografakis et al., 2011). In a study by Ásványi et al. (2017), renewable energy was examined in the service sector and specifically in the tourism industry. Energy is an important resource for the operation of hotels, a large part of which is used for lighting, heating, air conditioning and laundry facilities (Chan, 2008; Nikolaou et al., 2012; Shiming & Burnett, 2002; Teng et al. 2012). The hotel industry is associated with excessive energy consumption (Cheung & Fan, 2013; Chou, 2014). Common energy saving practices implemented by hotels include the use of energy efficient lighting, the installation of renewable energy systems, energy efficient power cards, the use of solar energy and the use of energy efficient devices. Therefore, reducing energy consumption in hotels can greatly reduce carbon emissions and reduce the negative effects of greenhouse gas emissions for the hotel industry (Tang et al., 2011).

Nikolaou et al. (2012) suggested that just over half of the hotels on the Greek island of Corfu are installed with solar water heaters. Teng et al. (2012) suggested that hotels can reduce their energy consumption by 20-40% without affecting the functionality of the hotel. However, the use of occupancy sensors to control lighting (Tarí et al., 2010), maximizing the use of natural light (Ali et al., 2008) and compact fluorescent lamps also affect energy use in the tourism sector. In 2009, the World Tourism and Travel Council established goals to cut carbon emissions by 25 to 30 percent by 2020 and by 50 percent by 2035 (Tian et al., 2021). On the basis of the commitment of 196 nations, the Paris Climate Agreement aspires to maintain global average temperatures below -2C relative to pre-industrial levels. Despite this lofty goal, relatively few nations have developed comprehensive tourism-related mitigation measures, and even fewer have put them into practice (Sun & Higham, 2021). In Kenya, as in most countries in this part of Africa, tourism is strictly dependent on the health and quality of the region's natural resources. Kenya, like the region, has a rich diversity of flora, fauna and natural landscapes (Kitheka & Backman, 2016). Sustainable tourism or eco-friendly tourism is defined as any green niche product or any tourism product that includes goods, services and/or practices that are considered to cause little harm to the environment (Diamantis & Ladkin, 1999; Dalton et al., 2008).

Energy is essential to contemporary economies because the need for it in production and consumption of goods and services necessary for day-to-day living drives economic growth. The 21st century has been dubbed the “period of green economic growth”, and it is in this century that we are experiencing fresh discoveries and incredible advancements in technology that produce energy from the limitless renewable energy sources available in the natural world (Nguyen et al. 2021). Tourism of different countries in the African continent (Chipumuro & Chikobvu, 2022; Diab et al., 2015; Huseynli, 2022a; Kitheka & Backman, 2016; Mekonnen, 2019) and energy (Cameron et al., 2012; Handiso, 2018; Mariita, 2002; Salem & Osman, 2016; Tilahun, 2012) there are studies on the sectors. The majority of energy consumption in the tourist industry is attributable to the usage of electrical energy. With the rapid expansion of solar photovoltaic and wind power in the most recent years, the electricity industry continues to be the primary focus of renewable energy research and development (Duong et al. 2018). Considering all these, this study aims to investigate the relationship between renewable energy and the tourism sector. From this point of view, this hypothesis was tested with Granger causality analysis on Egypt, Kenya and Ethiopia, which are the pioneers of renewable energy in Africa.

Literature review

Tourism

Tourism has an important role for sustainable development (Webster & Ivanov, 2013). Rich countries have much better tourism infrastructures and the ability to develop attractive tourism products than economically weak and disadvantaged countries. This also affects the country's image and attractive tourism image (Navickas & Malakauskaite, 2009; Dwyer & Kim, 2003). However, tourism can help create income and employment opportunities for the host community (UNWTO, 2005). As Kumar and Hussain (2014) report, more often, positive economic impacts force most governments, businesses and individuals to engage in tourism development. Tourism plays an important role in the economy of most countries in the world with its direct, indirect and induced economic effects (World Tourism and Travel Council, 2013). Mishra et al. (2021), the tourism-growth relationship was examined in the context of BRICS countries. Jago (2012) has introduced the positive economic impacts of the travel and tourism sector, including income generation, job creation and infrastructure development.

Renewable energy

Environmental pollution and the threat of sustainable development from traditional energy sources also affect the use of renewable energy sources. The energy obtained from renewable sources such as sun, wind and biogas is used as renewable energy. Solar energy is also increasingly used and recognized as a natural resource with economic and environmental benefits (Alexander & Kennedy, 2002). The correlation between economic growth and energy economy has always been associated with energy efficiency and energy demand (Leitão & Lorente, 2020). The growth in world energy consumption is estimated to be 2.3%/year (Saheb Koussa & Koussa, 2016). With increasing energy demand and concerns about population growth, fossil fuel sources cannot be a reliable option to provide the required energy (Mousavi & Mehrpooya 2020). Renewable energy is very important in terms of the convenience it offers, environmental cleanliness and the absence of a threat that can be exhausted. Many countries now meet their domestic energy needs by taking advantage of the benefits of renewable energy (Huseynli, 2022b).

The use of energy is an essential component of everyday life and plays a significant role in a variety of fields, including commercial, transportation, and residential users. Residential users are responsible for the consumption of forty percent of the world's total energy output (Dawson, 2015). In recent years, a significant amount of research has been put into the research and development of renewable energy technologies, as well as the synthesis and optimization of large-scale renewable energy supply chains and networks (Potrč et al., 2021).

Tourism and renewable energy sector of some countries on the African continent

Tourism and renewable energy in Egypt

Tourism is one of the most important sectors in Egypt's economy. Given the abundant sunlight and wind resources, the potential to use clean energy technologies is good in Egypt (Diab et al., 2015). So far, the use of renewable energy in Egypt has been limited to showing projects using only renewable energy technologies. No large-scale attempts have been made to use renewable energy. In addition, hybrid power systems using more than one power generation technology were not used (Kame & Dahl, 2005). The number of tourists in Egypt stood at 0.1 million in 1951, with a tremendous rise to 1.8 million in 1981 and then to 5.5 million in 2000. There are many tourist cities in Egypt, five of which were selected for this study: Luxor, Giza, Alexandria, Qena and Aswan (Diab et al., 2015).

Current distribution of energy projects in Egypt refers to 85 per cent approximately of total projects concentrated around Cairo, and 15 per cent is concentrated near to Aswan, where hydropower is generated (Mostafa, 2014). Egypt is a very rich country by the renewable energy sources, especially wind and solar. Therefore, it became a must to adopt the renewable energy after current shortage of energy in Egypt (Salem & Osman, 2016). Egypt has witnessed a shortage in energy production, especially in the last two years; therefore, the Egyptian government has set an ambitious target of providing renewable energy for twenty percent of the national electricity (twice the current share) by 2020 (Salem & Osman, 2016). The electricity generation capacity from wind farms in Egypt in 2016 was 753 MW (Energy Information Administration, 2018). To increase the share of renewable energy in the country's electricity generation mix, Egypt has set targets to develop the country's large renewable energy potential to generate 20% and 42% of its electricity from renewable sources, respectively, by 2022 and 2035 (International Renewable Energy Agency, 2018).

Tourism and renewable energy in Kenya

Tourism is one of Kenya's most important industries, contributing about one-fifth of the country's gross domestic product (Kitheka & Backman, 2016). Tourism plays a central role for Kenya's economy and is one of the country's six economic pillars in Vision 2030 (Government of Kenya, 2007). Figures from a decade ago show that tourism contributes 10% of Kenya`s GDP, making it the third largest sector after agriculture and manufacturing (International Monetary Fund, 2010). Kenya is a preferred destination by visitors from Europe, North America, Australia and Southeast Asia (Akama & Kieti, 2007). However, tourism in Kenya is based on wildlife safari and beach tourism in a narrow sense (Manyara & Jones, 2007; Rotich et al., 2012). 65% of Kenya's wildlife live in community and private lands, therefore making conservancies a more viable model for conservation in Kenya (Kenya Wildlife Conservancy Association, 2020). In a study conducted by Kitheka and Backman (2016), the extent to which environmental sustainability has been popularized in tourism policy in Kenya, one of the world's leading Safari tourism destinations, was analyzed.

A study by Osiako and Szente (2021) examined articles on domestic tourism in Kenya written in English from January 1990 to August 2020. At the conclusion of the study, the findings of other studies conducted on domestic tourism in different parts of Kenya are summarized and ways to improve future research on domestic tourism in Kenya are discussed. In the study by Mariita (2002) the local environmental and socio-economic impact of the geothermal power plant on the poor rural community in Kenya was examined. Moreover, despite the abundance of potential and strong growth in electricity demand, Kenya faces constraints in meeting its electricity demand. Of the potential renewables, Kenya has used only 30% of its hydroelectric resources, about 4% of its potential geothermal resources, and much smaller proportions of its proven wind and solar potentials (Kiplagat et al., 2011). However, there is great potential in Kenya for the development of biomass-based energy such as electricity generation from biogas, biodiesel and bagasse (Cameron et al., 2012). Kenya can generate between 5000 MW and 10,000 MW of electricity from geothermal resources in the country. It is estimated that around 6000 MW of electricity can be generated from the hydropower potential, including small hydro potential fields with a total potential of more than 3000 MW (DLA Piper, 2019). Kenya also has wind resource potential in areas suitable for wind power generation along Lake Turkana and the Ngong Hills. Average wind speeds in northwest Kenya are about 9 m/s at 50 m and about 5–7 m/s at 50 m along the coast (get-invest.eu, 2020).

Kenya is East Africa's largest economy. Since the early 2000s, Kenya has experienced steady economic growth, mainly due to the introduction of market-based reforms and greater

incentives for private investment, both local and foreign (World Bank & International Finance Corporation, 2012). Renewable energy generation is currently a major business in Kenya (Mwangi et al., 2013). Van der Zwaan et al. (2019) provided evidence of substantial public support for the large-scale deployment of three renewable energy options in Kenya: wind, solar PV and geothermal energy. Kenya is close to the equator, there is plenty of solar energy throughout the year. Its radiation level is 4–6 kWh/m2/day and its total potential is 23,046 TWh/year, making it promising enough for electricity generation from solar PV and concentrated solar power systems (DLA Piper, 2019; get-invest.eu , 2020). Since Kenya has a long coastline, it is also rich in ocean energy resources (Aboagye et al., 2021).

Tourism and renewable energy in Ethiopia

Ethiopia is a country with many remarkable and amazing tourism attractions (Tafere et al., 2021). Tourism could generate $1.9 billion which is 5.1% of Ethiopia's total GDP from the tourists direct expenditures on the services and products which resulted in total contribution of $4.5 billion (12.3% of GDP) in 2012 (World Tourism and Travel Council, 2013). The tourism sector has continued to grow since 2001 in Ethiopia (World Bank, 2006), which for two decades from 1974 has suffered from various adverse effects such as industry, protracted civil war, recurrent drought, and restrictions on entry and free movement of tourists. However, the share of the sector in GDP is very low (Ali, 2016). Tourism is one of Ethiopia's most important incomes. It is very important to electrify rural tourist attractions in order to increase this income from the current 10% of national gross domestic product to high values (Mekonnen, 2019). A study by Mekonnen (2019) examined the correlation of main renewable energy sources with electricity generation on small islands in Lake Tana, one of Ethiopia's top tourist destinations. Since Ethiopia's energy source relies on hydroelectricity, availability is susceptible to water scarcity. There is considerable resource of hydropower in most part of the country. The 88-90% of Ethiopia's electric generation is based on hydroelectric sources (Tilahun, 2012).

Ethiopia's electric energy generation (KWh) according to the data of EEPCO is 51.16 per capita. And also the installed capacity performance (MW) in year 2010 is 2060. Hydro covers 88%, diesel 11% and geothermal 1%; the diesel power plants are isolated systems and 60 MW is rented for facial time. From hydro power plants Tana Beles covers 22%. The total number of customers who are connected to get electric energy from the system amounts to1, 896,265 which is from 75.8 million population size of Ethiopia. The total energy generation and sales is 3.981 and 3.264 TWh respectively (Tilahun, 2012).

In Ethiopia, hydropower plays an important role in reducing energy poverty and increasing the multi-purpose use of natural resources. Ethiopia is rich in natural resources, including water to generate energy, but its electricity supply is still uncertain. The data show that the country has the potential to generate 50,000 MW of energy from its water resources. However, in 2018 it utilized 3,822 MW, accounting for about 7.6% of its potential (Handiso, 2018). The hydro potential in Ethiopia is huge with an estimated capacity of around 45,000 MW per year, while the small hydro potential is estimated at 1500 MW (Khan & Singh, 2017). The total solar PV potential is estimated to be 27,154 TWh/y (Aboagye et al., 2021). There is also a significant wind energy resource potential in Ethiopia, which is classified as very good for wind power generation. Ethiopia's total wind energy potential is approximately 10,000 MW (Gaddada & Kodicherla, 2016).

Research methodology

In this study, the relationship between renewable energy and tourism sector is discussed in terms of selected African continent countries. The data set of these countries, which were included in the analysis as Egypt, Kenya, and Ethiopia, was researched to include the period

1997-2015. The information required for the data set was obtained from the World Bank database. The fact that the data set in the context of renewable energy was not disclosed after 2015 caused the study to be limited for a period until 2015.

The hypotheses created within the scope of this study were tested through econometric analyzes based on the data of three countries in the African continent. Because the statistical analyzes are more reliable, the data used in the research were obtained from the World Bank. In these reports, general renewable energy consumption of the country during the relevant period and general tourism data during the relevant period were used. The data set required for the study was researched to include the period 1997-2015. The information required for the data set was obtained from the World Bank database. The fact that the data set in the context of renewable energy was not disclosed after 2015 caused the study to be limited for a period until 2015.

The leading countries of the African continent in terms of renewable energy are the countries examined by taking this study as an example. Egypt, Kenya, and Ethiopia were included in the analysis as selected countries. In terms of these countries, the renewable energy consumption, the number of tourists coming to the country and the revenues from the tourism sector constitute the data set. A series of tests were conducted to measure the causal relationship between these variables. Then, the data were subjected to Granger causality analysis to make the analysis part.

Results

ADF unit root test results are summarized in Table 1.

Table 1. Level values of series

Egypt							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**Possibility**	**t-statistics**	**Possibility**
ADF testing statistics		-0.942325	0.7500	-1.598293	0.4630	-1.392333	0.5626
Test Critical Values	**%1**	-3.857386		-3.857386		-3.857386	
	%5	-3.040391		-3.040391		-3.040391	
	%10	-2.660551		-2.660551		-2.660551	
Kenya							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**t-statistics**	**Possibility**	**t-statistics**
ADF testing statistics		0.497629	0.9815	-1.578617	0.4725	-1.102932	0.6908
Test Critical Values	**%1**	-3.857386		-3.857386		-3.857386	
	%5	-3.040391		-3.040391		-3.040391	
	%10	-2.660551		-2.660551		-2.660551	
Ethiopia							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**t-statistics**	**Possibility**	**t-statistics**
ADF testing statistics		-0.114420	0.9337	0.826700	0.9915	0.557115	0.8575
Test Critical Values	**%1**	-3.857386		-3.857386		-3.857386	
	%5	-3.040391		-3.040391		-3.040391	
	%10	-2.660551		-2.660551		-2.660551	

In the study, the Granger causality method was used to test the relationship between renewable energy and the tourism sector. Therefore, the stationarity of the variables was tested first. If the ACF (Autocorrelation Function-ACF) starts from a very high value and decreases very slowly, it is an indication that the series is not stationary. Simply put, if the mean, variance, and covariance of a time series change over time, then the time series is non-stationary. We cannot usually put non-stationary series into regression. Non-stationary series can have an erroneous correlation and confuse our analysis. This situation is called spurious regression. Series that seem to move with the change of time often have nothing to do with each other. ADF tests are included for unit root analysis.

As a result of the ADF unit root test, it was observed that the data were not stationary. For this reason, the data should be stationary. As a result of the analysis, the results of the second-order stationary states of the data and their stationarity levels are given in Table 2.

Table 2. Second-order stationarity values of the data

Egypt							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**t-statistics**	**Possibility**	**t-statistics**
ADF testing statistics		-5.185488	0.0015	-9.112844	0.0000	-10.99355	0.0000
Test Critical Values	**%1**	-4.057910		-3.920350		-3.920350	
	%5	-3.119910		-3.065585		-3.065585	
	%10	-2.701103		-2.673459		-2.673459	
Kenya							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**t-statistics**	**Possibility**	**t-statistics**
ADF testing statistics		-4.838810	0.0023	-7.206697	0.0000	-6.055582	0.0002
Test Critical Values	**%1**	-4.004425		-3.920350		-3.920350	
	%5	-3.098896		-3.065585		-3.065585	
	%10	-2.690439		-2.673459		-2.673459	
Ethiopia							
		Renewable energy consumption		**Number of tourists**		**Tourism revenues**	
		t-statistics	**Possibility**	**t-statistics**	**t-statistics**	**Possibility**	**t-statistics**
ADF testing statistics		-4.772982	0.0022	-5.650895	0.0005	-5.503324	0.0006
Test Critical Values	**%1**	-3.959148		-3.959148		-3.959148	
	%5	-3.081002		-3.081002		-3.081002	
	%10	-2.681330		-2.681330		-2.681330	

For the Granger method, which is used to test the causality relationship between the variables, the appropriate lag length must first be determined. When performing the causality test, we need to choose an appropriate lag length. We can usually take the delay length as 1, 2 or 3, but choosing it objectively would be the best approach. We can choose the most suitable lag length according to the information criteria.

Table 3. Appropriate delay length

Egypt						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	27.54554	NA	9.34e-06	-3.068192	-2.923332	-3.060774
1	55.69005	42.21676*	8.81e-07	-5.461256	-4.881814	-5.431584
2	67.64231	13.44630	7.13e-07	-5.830289	-4.816266	-5.778362
3	83.63551	11.99490	4.71e-07*	-6.704438*	-5.255834*	-6.630258*
Kenya						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-6.017787	NA	0.000620	1.127223	1.272084	1.134641
1	27.20398	49.83265*	3.10e-05*	-1.900497	-1.321055*	-1.870825
2	33.42473	6.998350	5.13e-05	-1.553091	-0.539069	-1.501165
3	47.79247	10.77581	4.15e-05	-2.224059*	-0.775455	-2.149879*
Ethiopia						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	3.929489	NA	0.000179	-0.116186	0.028674	-0.108768
1	52.05288	72.18509*	1.39e-06	-5.006610	-4.427169*	-4.976938
2	61.85015	11.02193	1.47e-06	-5.106269	-4.092246	-5.054342
3	76.63496	11.08861	1.13e-06*	-5.829370*	-4.380766	-5.755190*

*Indicates the appropriate lag length for the relevant test.

By using criteria such as Akaike information criterion (AIC), Bayesian information criterion (BIC), we can use the delay value that reaches the lowest information criterion value. Appropriate lag lengths for the dataset are shown in Table 3. After the appropriate lag length was determined, a transition to causality analysis was made. The Granger causality test is a statistical hypothesis test whether one time series is useful in predicting another time series. According to the theory, while explaining the causality relationship between two variables, it is checked whether the lagged values of the other variables contribute to explaining the current value of one of the variables.

In other words, if the explanatory power of a model designed to explain the value of a variable (Y) at time t increases when the lagged values of the other variable (X) are included; X is said to be the Granger cause of Y. The causality results of the relationship between the data used in the study are given in Table 4.

Table 4. Results of the Granger causality test

Hypotheses	**F-value**	**Probability value (p)**	**Decision at 5% significance level**
The number of tourists coming to the country in Egypt is the reason for the increase in renewable energy consumption in the country.	12.85810	0.0016	Accepted
Revenues from the tourism sector in Egypt are the reason for the increase in renewable energy consumption in the country.	7.661366	0.0217	Accept
The increase in renewable energy consumption in Egypt is the reason why more tourists come to the country.	0.393766	0.8213	Rejected
Income from the tourism sector in Egypt is the reason for the increase in the number of tourists coming to the country.	0.388771	0.8233	Rejected
The increase in renewable energy consumption in Egypt is the reason why the country earns more income from the tourism sector.	0.490291	0.7826	Rejected
The increase in the number of tourists coming to Egypt is the reason why the country gains more income from the tourism sector.	0.727573	0.6950	Rejected
The number of tourists coming to the country in Kenya is the reason for the increase in renewable energy consumption in the country.	1.183971	0.5532	Rejected
Revenues from the tourism sector in Kenya are the reason for the increase in renewable energy consumption in the country.	2.383122	0.3037	Rejected
The increase in renewable energy consumption in Kenya is the reason why more tourists come to the country.	1.720145	0.4231	Rejected
Revenues from the tourism sector in Kenya are the reason for the increase in the number of tourists coming to the country.	0.793954	0.6723	Rejected
The increase in renewable energy consumption in Kenya is the reason why the country generates more income from the tourism sector.	1.089399	0.5800	Rejected
The increase in the number of tourists coming to Kenya is the reason why the country earns more income from the tourism sector.	7.427403	0.0244	Accept
The number of tourists coming to the country in Ethiopia is the reason for the increase in renewable energy consumption in the country.	2.124206	0.3457	Rejected
Revenues from the tourism sector in Ethiopia are the reason for the increase in renewable energy consumption in the country.	0.794973	0.6720	Rejected
The increase in renewable energy consumption in Ethiopia is the reason why more tourists come to the country.	3.656122	0.1607	Rejected
Revenues from the tourism sector in Ethiopia are the reason for the increase in the number of tourists coming to the country.	3.187682	0.2031	Rejected
The increase in renewable energy consumption in Ethiopia is the reason why the country earns more income from the tourism sector.	3.908292	0.1417	Rejected
The increase in the number of tourists coming to Ethiopia is the reason why the country gains more income from the tourism sector.	3.098500	0.2124	Rejected

As can be seen from the table below, although there is a slight causal relationship between the data for Egypt and Kenya, no causality relationship was found between the data for Ethiopia. The reason for this is that although it uses renewable energy depending on climatic conditions, the country does not seem very attractive in terms of tourism. In addition, they do not care about the use of renewable energy by tourists during their travels in terms of environmental pollution. For Kenya, there is a significant relationship between the number of tourists coming

to the country and the income obtained from the tourism sector of this country. It also supports the expected hypothesis of this study. In other words, tourists coming to the country cause the country to earn more. When we evaluate it in terms of Egypt, it is an advantageous situation for Egypt to be a more developed and more touristic region compared to other countries. When we evaluate Egypt, there is a positive causality between the number of tourists coming to the country and renewable energy consumption. In addition, it was concluded that there is a causality between the incomes of the country from the tourism sector and the renewable energy consumption of this country.

Discussion and conclusion

Tourism is a developing sector throughout the world and has an important place in the country's economy. However, with the development in the tourism sector, fossil fuel consumption and therefore CO^2 emissions may increase. The aim of this study is to investigate the relationship between tourism and renewable energy. In the study, the economies of Egypt, Kenya, and Ethiopia, which are in the African continent and lead renewable energy in this continent, were analyzed with the Granger causality test. As a result of the causality analysis, a positive and significant relationship was found between the number of tourists coming to the country in Egypt and the renewable energy consumption of this country. In addition, it has been concluded that Egypt's earnings from the tourism sector also affect the renewable energy of this country. In terms of Kenya, although there is no significant relationship in terms of renewable energy, a significant relationship was found between the income obtained from the tourism sector of the country and the number of tourists. In terms of Ethiopia, no causal relationship has been determined. In the absence of a meaningful relationship between renewable energy and tourism, it can be stated that the tourists who come to the country do not care about environmental pollution in terms of energy. In other words, the inclusion of renewable energy in investments in the tourism sector in these countries will not affect the number of tourists. In this case, the approach that tourists from developed countries who are accustomed to renewable energy technology may prefer renewable energy in their country trips and touristic activities is not supported. In other words, the inclusion of renewable energy in investments in the tourism sector will not increase the number of tourists. According to this result, it can be said that the tourists do not consider the environmental quality in their country preferences.

On the other hand, the existence of a relationship between tourism and environmental quality in these countries is not included in the literature. For this reason, after the policies encouraging tourism, the increasing number of tourists will not increase the environmental pollution. However, it is seen that the policies implemented to increase the environmental quality do not attract tourists. For the development of the tourism sector, emphasis should be placed on the promotion of the country's historical and natural beauties.

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