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EXAMINING THE NEXUS BETWEEN TOURISM INVESTMENTS, RENEWABLE ENERGY CONSUMPTION AND CO_2 EMISSIONS IN INDONESIA

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Abstract

The tourism industry undoubtedly contributes positively to economic growth. However, numerous studies show that tourism can have diverse impacts on environmental quality. This study focuses on exploring the correlation between investment in the tourism sector, the renewable energy consumption, and the contribution of tourism-related sectors to CO_2 emissions within the period 2000 – 2017 using a case study in Indonesia. By employing the distributed lag method with the Koyck approach, this study found that investment in the tourism sector in Indonesia has a statistically positive and significant correlation with CO_2 emissions. Conversely, renewable energy consumption, as the control variable, exhibits a significant negative correlation with CO_2 emissions. The findings suggest that the existing investment policies in Indonesia are not aligned with environmental sustainability, supporting the pollution haven hypothesis. To address this, the study underscores the need for stronger commitments to transitioning from fossil-based to renewable energy sources, ensuring that future tourism investments contribute to both economic growth and environmental preservation.

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INTRODUCTION

As the largest archipelagic country in the world, Indonesia has enormous potential to attract tourists due to its diverse natural and cultural heritage. In 2019, before the pandemic, this sector became one of Indonesia's primary economic drivers, contributing 4.97% to the national Gross Domestic Products (GDP) (BPS, 2023). This sector drew significant capital from both domestic and foreign investors. Families, companies, or affluent individuals were increasingly viewing hotels as valuable heritage assets as a means of diversifying their business (PwC, 2021).

However, the tourism industry's growth often comes at a high environmental cost, particularly with respect to CO_2 emissions and the consumption of fossil fuels (Danish & Wang, 2018; Gössling & Peeters, 2015; Katircioğlu, 2014; Scott et al., 2016). This trade-off poses a challenge for policymakers: how can Indonesia continue to profit on its tourism potential without jeopardizing the country's environmental objectives, particularly its commitment to reducing CO_2 emissions? Understanding the relationship between tourism investment, renewable energy consumption, and CO_2 emissions is essential for formulating policies that balance economic growth with environmental sustainability.

By exploring the nexus between these three factors, this paper provides insights into how Indonesia can manage its tourism growth in a way that not only maximizes economic benefits but also ensures environmental sustainability. Such a strategy is necessary for long-term national prosperity, as unrestricted CO_2 emissions could eventually harm the ecosystems and natural resources that attracted to Indonesia in the first place.

Existing literature on tourism economics generally discusses of how the tourism industry contributes to economic growth, with some studies exploring the impact on the environment. Several studies highlight the tourism industry as an important sector for economic development (Fauzel, 2021; Fauzel et al., 2017; Kumar et al., 2015; Rasool et al., 2021; Wu et al., 2022). A study by Liu et al. (2022) demonstrated that the tourism sector boosts economic activities that support long-term growth, with substantial evidence from countries like France, the United States, and China. This positive impact is often attributed to the multiplier effect, where increased tourism spending stimulates the economy in other areas, which results in overall economic growth.

Despite its contribution to economic growth, the tourism sector is also argued to contribute to environmental degradation due to its heavy reliance on fossil fuels, which disrupt the climate system through GHG emissions (Danish & Wang, 2018; Gössling & Peeters, 2015; Katircioğlu, 2014; Scott et al., 2016). Nosheen et al. (2021) observed that tourism, free trade, and urbanization deteriorated the environmental conditions in Asian economies, suggesting the need for sustainable tourism and renewable energy sources. Similarly, Sherafatian-Jahromi et al. (2017) argue that there is a long-term relationship between tourism and CO_2 emissions.

Given the environmental challenges associated with tourism, it is essential to explore how investment in this sector may exacerbate these issues. The Pollution Haven Hypothesis (PHH) is frequently used to observe the nexus between investment and carbon emissions. According to this theory, pollution levels rise when foreign direct investment (FDI) enters nations with more relaxed environmental regulations. Studies by Duan and Jiang (2021), Singhania and Saini (2021), and Nejati and Taleghani (2022) support this hypothesis. Additionally, Baek (2016) delved into the relationship between investment,

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income, energy, and the environment in 5 ASEAN countries and found that foreign investment increases CO_2 emissions, supporting the pollution haven hypothesis. While in the low-income countries, FDI will increase CO_2 emissions, in high-income countries, it will reduce them.

Some researchers have concluded different results. For instance, Hong et al. (2017) found that in addition to encouraging economic growth, government investment in the research and development sector and private investment in equipment can reduce CO_2 emissions. While new technology equipment could lower CO_2 emissions, the development of new technology may increase productivity and competitiveness, leading to higher output, which can indirectly raise CO_2 emissions. Lee and Brahmasrene (2013) research revealed FDI, CO_2 emissions, and tourism have a high and significant impact on economic growth. In the end, economic growth will show a significant positive impact on CO_2 emissions, even while FDI and the tourism sector have a negative impact.

Previous research has thoroughly examined the connection between tourism, economic growth, and CO_2 emissions across diverse regions. The research of Sherafatian-Jahromi et al. (2017), Nosheen et al. (2021), and Handoyo et al. (2022) provided insights into these relationships within Asia. Similarly, the studies by Lee and Brahmasrene (2013), Paramati et al. (2017), Cró and Martins (2020), and Sokhanvar and Jenkins (2022) explore the impact of tourism and CO_2 emissions on economic growth in Europe. However, there is limited research on the impact of tourism investment on CO_2 emissions in Indonesia. This study aims to fill this gap by examining the link between tourism investment and environmental degradation, while also examining various factors that affect CO_2 emissions in Indonesia, including income per capita, use of renewable energy, and contributions from tourism-related sectors (such as hotels, restaurants, and transportation).

As global tourism is projected to grow significantly by 2030, and sustainability becoming a priority (OECD, 2018), this study aims to provide insight into sustainable development policies that balance Indonesia's economic growth and environmental preservation. This study also contributes to the literature by using the distributed lag method with the Koyck approach, which effectively models the diminishing impact of past values on CO_2 emissions over time. Focusing on Indonesia, a country with both high tourism growth potential and significant climate challenges, this research offers insights for shaping sustainable development policies in developing countries.

METHODOLOGY

This research uses data and publications between the period of 2000 and 2017 from reputable sources. Table 1 on the List of Variables provides a detailed explanation of all the variables used in this study.

Table 1. List of Variables

Abb.	Remarks	Unit	Source
Dependent Variable			
CO_2	Emisi CO_2	Kiloton (kt)	https://databank.worldbank.org/source/world-development-indicators

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Abb.	Remarks	Unit	Source
Main Independent Variable			
TI	Investment in the tourism sector (total investment realization in the tourism sector)	Trillion IDR	Publication of the National Tourism Satellite Account/Nesparnas (BPS and Kemenparekraf), processed by the Ministry of Tourism and Creative Economy
Independent Control Variable			
PI	GDP per capita (constant 2015)	US$	https://databank.worldbank.org/source/world-development-indicators
REC	Renewable energy consumption as part of total energy consumption	%	https://databank.worldbank.org/source/world-development-indicators
HRT	Contribution of subsectors of hotels and restaurants, and transportation against national GDP (including oil and gas)	%	https://www.bps.go.id/

Source: Data processed by author

The dependent variable in this study is the amount of CO_2 emissions, which has been frequently used as a proxy for environmental quality in the previous studies (Danish & Wang, 2018; Katircioğlu, 2014; Lee & Brahmasrene, 2013; Paramati et al., 2017). The main independent variables are investment in the tourism sector, by adding renewable energy consumption, and the contribution of the tourism sector, which is represented by the contribution to national income from the transportation, hotel, and restaurant sectors as a control variable. Quantitative analysis is conducted to investigate the relationship between these variables using the distributed lag method with the Koyck approach. This method allows for the exploration of lagged effects over time.

Before estimating, the values for each of the CO_2 emissions (CO_2), per capita income (PI), and tourism investment (TI) variables were converted into natural logarithm form so that the CO_2 emission function specification is expressed through the following equation:

$$lCO_2 = f(lTI, lPI, REC, HRT) \quad \ldots(1)$$

This research model adopts the model specifications developed by (Ben Jebli et al., 2019; Katircioğlu, 2014; Khan et al., 2020), which links CO_2, tourism, investment, and renewable energy consumption. The use of renewable energy consumption as a control variable refers to the model developed by Pata et al. (2023) and Wang et al. (2022), who examined the relationship between investment, energy consumption and income. Meanwhile, considerations for including the contribution of the transportation sector, as well as hotels and restaurants as the control variable are based on the fact that emissions from the tourism sector result from transportation as much as 75%, accommodation 21%, and tourist attractions such as museums and amusement parks around 4% (UNWTO & International Transport Forum, 2019). Apart from that, several previous studies also used the hotel and restaurant sector as a proxy for the tourism sector (Cró & Martins, 2020; Endo, 2006).

To estimate this model, this research uses the Koyck approach, which is a type of technique used to analyze time series data. In a regression model that uses time series data,

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if the model not only uses present values but also delays past values of the independent variables, this model is defined as a distributed lag model (Gujarati, 2003). However, the weakness of using a distributed lag model is the problem of multicollinearity and degrees of freedom which decrease geometrically as the lag length increases (Dikmen, 2005; Erdal et al., 2009; Klein, 1958). To overcome this problem, the Koyck approach is used to estimate parameters in the distributed lag model. The form of the equation using the Koyck approach is denoted as follows:

$$y_t = \sum_{k=0}^{\infty} \beta_k \, x_{t-k} + u_t \quad \text{...(2)}$$

What often happens is that the dependent variable takes time to respond to the independent variable. In this case, CO_2 emissions respond to TI after some time. The time to respond is called the "lag period" (Dikmen, 2005; Erdal et al., 2009). The researcher who first used this approach was Irving Fisher (Erdal et al., 2009; Klein, 1958), the distributed lag model takes into account not only the variable values in the current year but also the variable values in the previous year. How far the lag is used to define the variable is not explained. Therefore, this approach is called the unlimited lag model (Klein, 1958), which is expressed in following equation (3).

$$lCO_{2_t} = \alpha + \beta_1 lTI_{t-1} + \beta_2 lTI_{t-2} + \cdots + u_t \quad \text{...(3)}$$

On the other hand, if the number of years back (t) is defined as (k), the model is called "finite distributed lag", as follows:

$$lCO_{2_t} = \alpha + \beta_1 lTI_{t-1} + \beta_2 lTI_{t-2} + \cdots + \beta_i lTI_{t-k} + u_t \quad \text{...(4)}$$

Furthermore, the unknown parameters (α, β0,.....βi) in this model can be estimated using the ordinary least squares (OLS) method (Gujarati, 2003). Based on the assumption that the lag in the independent variable influences the dependent variable to a certain extent and the weight of the lag decreases geometrically, the model is reduced, and a regression equation is estimated (Dikmen, 2005; Erdal et al., 2009). To obtain the reduced model, Koyck assumes that in an infinite distributed lag, all β have the same sign and decrease geometrically as shown below, where λ is the rate of decline of distributed lag and β_k is the lag coefficient.

$$\beta_k = \beta_0 \, \lambda^k \text{ where } k = 0,1, \ldots \quad \text{...(5)}$$

Assuming $0 < \lambda < 1$, the closer λ is to 1, the smaller the decrease in β_k and the closer λ is to zero, the greater the decrease in β_k (Gujarati, 2003). As lCO_2 goes back into the distant past, the lag effect on lCO2t becomes smaller. Geometrically, Koyck's scheme is described in Figure 1.

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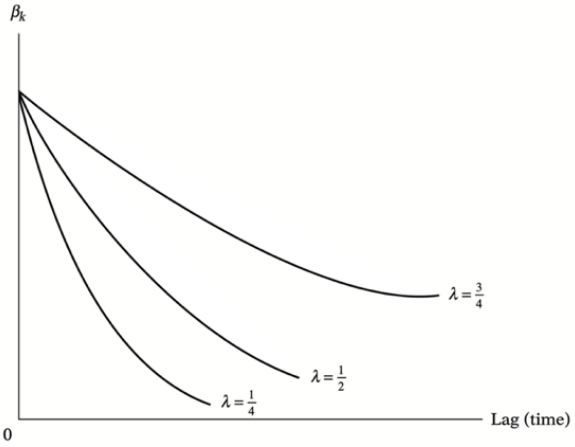

Figure 1. Koyck Scheme (Geometrically Distributed Lag)
Source: Gujarati, 2003

Assuming $0 < \lambda < 1$, Koyck gives lower weight to β in the distant past than to the present; and Koyck ensures that the sum of β, which gives the long run multiplier, is finite, then:

$$\sum_{k=0}^{\infty} \beta_k = \beta_0 + \frac{1}{(1-\lambda)} \quad \ldots(6)$$

Thus, the infinite lag model can be written as follows:

$$lCO_{2_t} = \alpha + \beta_0 lTI_t + \beta_0 \lambda lTI_{t-1} + \beta_0 \lambda^2 lTI_{t-2} + \cdots + u_t \quad \ldots(7)$$

However, the linear regression analysis method (in parameters) cannot be applied to the model in equation (7). Therefore, Koyck suggests adding the lag by one period to get the following equation:

$$lCO_{2_{t-1}} = \alpha + \beta_0 lTI_{t-1} + \beta_0 \lambda lTI_{t-2} + \beta_0 \lambda^2 lTI_{t-3} + \cdots + u_{t-1} \quad \ldots(8)$$

Next, by multiplying both sides by λ, we obtain the equation:

$$lCO_{2_{t-1}} = \lambda\alpha + \lambda\beta_0 lTI_{t-1} + \beta_0 \lambda^2 lTI_{t-2} + \beta_0 \lambda^3 lTI_{t-3} + \cdots + u_{t-1} \quad \ldots(9)$$

By subtracting equation (9) from equation (7), then:

$$lCO_{2_t} - \lambda lCO_{2_{t-1}} = \alpha(1-\lambda) + \beta_0 lTI_t + (u_t - \lambda u_{t-1}) \quad \ldots(10)$$

Which can be simplified as follows:

$$lCO_{2_t} = \alpha(1-\lambda) + \beta_0 lTI_t + \lambda lCO_{2_{t-1}} + v_t \quad \ldots(11)$$

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Whereas $v_t = (u_t - \lambda u_{t-1})$ is the moving average mean of u_t dan u_{t-1}. Therefore, using the ordinary least square (OLS) estimation method, the following regression equation is created:

$$lCO_{2_t} = \alpha + \beta_0 lTI_t + \lambda lCO_{2_{t-1}} + v_t \quad ...(12)$$

By adding control variables to the equation, then:

$$lCO_{2_t} = \alpha + \beta_0 lTI_t + \lambda lCO_{2_{t-1}} + \gamma X_t + v_t \quad ...(13)$$

Where CO_2 is CO_2 emissions, TI is the value of tourism investment, X is a control variable consisting of contribution or share of renewable energy consumption to total energy consumption (REC), and share of the tourism sector (in this is represented by the hotel and restaurant sector, as well transportation) to national GDP (HRT), α is the coefficient of TI, γ is the coefficient of each control variable, and ε is the error term.

FINDINGS AND DISCUSSION

To estimate the model, the author used Stata 16 software. First, the author carried out a data normality test and a classical assumption test, which aims to explore whether in the model there are problems with heteroscedasticity, autocorrelation or multicollinearity which will affect the validity of the regression results, as well as a stationarity test. To determine the existence of multicollinearity between the dependent variable (lCO_2) and the independent variables (lTI, lPI, REC, and HRT), estimation was carried out using Ordinary Least Square (OLS) and evaluating the variance inflation factor (VIF). VIF is the commonly used measure of multicollinearity of independent variables in regression models.

From the VIF Table shown in Table 2, the VIF values for all variables are much greater than the maximum tolerance of 10 except for the HRT variable. This shows the existence of multicollinearity between the independent variables. To ensure the accuracy of the regression model, overcome the influence of multicollinearity between variables on the regression results, and increase the stability and reliability of the regression coefficients, the author issued an lPI that had a VIF value far above the mean. The following are the results of the VIF test after lPI was removed from the model. With the VIF value of all variables less than 10, there is no longer any collinearity in the model. Table 3 presents the VIF results after removing the lPI variable from the model.

Table 2. VIF Result on Variable in the Model

Variable	VIF	1/VIF
lPI	47.32	0.021131
lTI	22.24	0.044960
REC	18.17	0.055039
HRT	2.41	0.415225
Mean VIF	22.54	

Source: Data processed by the author

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Table 3. VIF Result after Omitting the lPI Variable

Variable	VIF	1/VIF
lTI	9.56	0.104559
REC	8.75	0.114309
HRT	2.28	0.439199
Mean VIF	6.86	

Source: Data processed by the author

Because of the cointegration in the model, the estimation is carried out using the distributed lag method via the Koyck approach. The use of the distributed lag method is to determine the long-term balance relationship between investment in the tourism sector, as well as other control variables (renewable energy consumption, the share of GDP in the hotel and restaurant sector, and transportation) on CO_2 emissions. Regression results using the Koyck approach can be seen in Table 4.

Table 4. Regression Results with Koyck Approach

Variable	Coefficient	Standard Error
lCO_2 (-1)	-0.1506445	0.1756196
lTI	0.1070063***	0.0298493
REC	-0.0162411***	0.0033529
HRT	0.0442102	0.0660564
	0.9415	
T statistics: *p < 0.1; **p<0.05; ***p<0.01		
R-squared: 0.9844		

Source: Data processed by the author

From the application of the Koyck approach in the regression, the results show that statistically, tourism sector investment has a significant positive correlation with CO_2 emissions. This finding suggests that the higher the percentage increase in tourism investment, the higher the percentage increase in CO_2 emissions. If investment in the Indonesian tourism sector increased by 1% in the past year, then CO_2 emissions would also increase by 0.107% ceteris paribus. This relationship supports the pollution haven hypothesis, which posits that FDI in countries with more relaxed environmental regulations leads to increased pollution.

From 2000 to 2017, Indonesia experienced parallel upward trends in both tourism investment and CO2 emissions. Figure 2 illustrates that tourism investment and CO_2 emissions continued to increase from 2000 to 2012, fell slightly in 2013, and then slowly resumed an upward trajectory. Notably, from 2000 to 2012, tourism investments slightly surpassed CO_2 emissions, highlighting the potential environmental costs associated with the sector's growth. This pattern suggests that investment strategies might not sufficiently addressed environmental sustainability.

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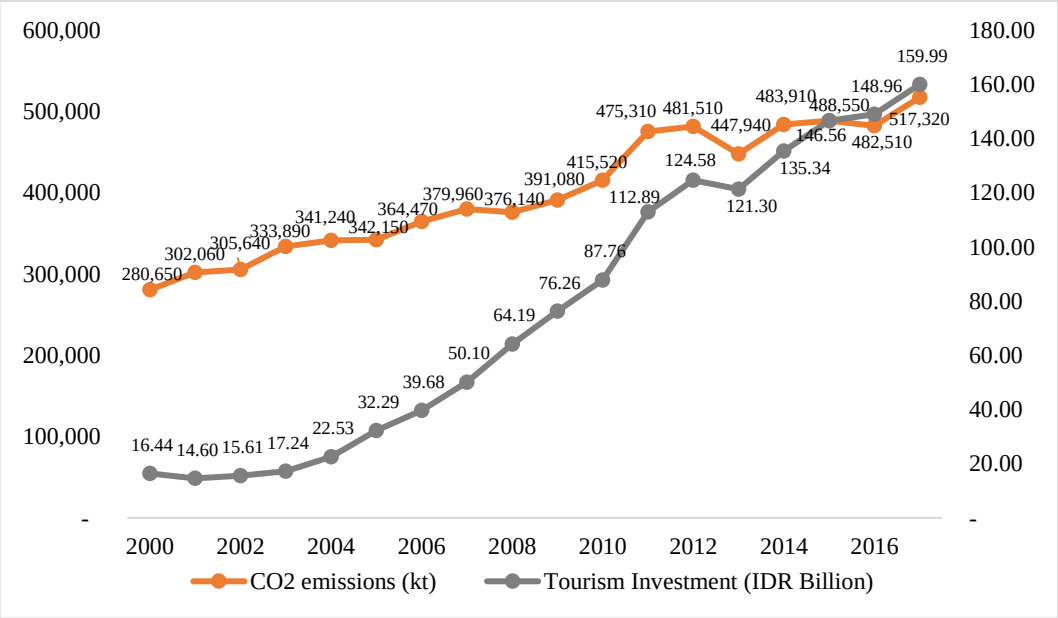

Figure 2. CO_2 Emissions and Tourism Investment in Indonesia (2000–2017)
Source: Data processed by the author

Tourism Investment and CO_2 Emissions

Indonesia has been an increasingly attractive travel destination for its diverse landscapes and ecosystems. This potential may be the reason why many investors are interested in investing in Indonesia in the tourism sector. When investment enters a country, the government of the country receiving the capital has the choice to implement stricter or more lenient policies regarding the use of that capital. Countries that implement strict policy requirements for investors to use environmentally friendly energy or technology tend to experience a pollution halo, where investments contribute to sustainability. On the other hand, countries that provide lenient environmental policies towards incoming investment tend to become pollution havens, where investments tend to exacerbate the environmental degradation.

The result of this study supports the Pollution Haven Hypothesis (PHH), which posits that foreign direct investment (FDI) in countries with less stringent environmental regulations leads to higher pollution levels. This hypothesis is supported by the observed correlation between tourism investment and CO_2 emissions in Indonesia. However, while the PHH provides a framework for understanding the environmental impact of FDI, it does not fully account for the specific dynamics of tourism-related investments and their effects on different sectors.

This study's results are in line with previous research (Baek, 2016; Bulus & Koc, 2021; Danish & Wang, 2018; Handoyo et al., 2022; Omri et al., 2014; Singhania & Saini, 2021; Tran et al., 2022), which suggested that investment (FDI) increases CO_2 emissions, ceteris paribus. However, the impact of tourism investment on CO_2 emissions varies by context. For instance, according to Baek's (2016) research, the income level, relationship between energy consumption and CO_2 emissions is always positive and highly significant. Tourism investment in Brazil, Russia, India, China, and South Africa (BRIC countries), which are regarded as major tourism destinations, was found to have a positive and significant impact on economic growth but lower CO_2 emissions (Danish & Wang, 2018).

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At the country-specific level, Mert and Caglar (2020) found that investment is a major factor that helps reduce the CO_2 emissions level in Turkey.

Differing from the results of this study, Abbasi et al. (2023) highlight that the impact of FDI on pollution varies depending on the country's economic development, environmental policies, and the types of industries attracting foreign investment. Countries with stronger environmental regulations tend to experience a more positive effect (pollution halo), while those with weaker regulations tend to attract polluting industries (pollution haven). A study of Mert and Caglar (2020) examines the impact of foreign direct investment (FDI) on Turkey's environmental quality, specifically testing the Pollution Haven Hypothesis (PHH) and Pollution Halo Hypothesis (PH). The results show partial support for pollution halo hypothesis. In case of Turkey, positive movements in FDI lead to long-run increases in emissions, but in the short run, FDI has a negative impact on emission growth. Additionally, negative changes in FDI also contribute to long-run increases in emissions, while short-term effects are the opposite (Mert & Caglar, 2020).

Renewable Energy Consumptions and CO_2 Emissions

From the regression result in Table 4, the coefficient for REC shows a negative sign and is significant, which indicates that increasing the use of renewable energy sources can reduce the environmental impact of tourism investments. The finding of this study is consistent with the broader literature, which advocates for a transition to renewable energy to achieve sustainable development. A study by Nosheen et al. (2021) further emphasizes the need for sustainable tourism practices and renewable energy sources to reduce environmental degradation in Asian economies. According to OECD (2020), fossil fuels continue to dominate electricity investment in Indonesia, where for every dollar invested in renewable electricity generation in 2019, three dollars was invested in coal power. The results of previous study of Ben Jebli et al. (2019) are also consistent with the idea that more renewable energy consumption reduces fossil energy consumption and the associated emissions. Their research revealed that using renewable resources greatly lowers CO_2 emissions. This could be because the level of pollution in these 22 countries within the Central and South American regions draws foreign investors to implement more projects using renewable energy.

This study also explored the relationship between renewable energy consumption and CO_2 emissions. Although the regression results indicate an inverse relationship between renewable energy usage and CO_2 emissions, the correlation was not statistically significant. This result suggests that Indonesia has not utilized renewable energy to its full potential. Figure 3 illustrates how renewable energy consumption in Indonesia has declined over time. The percentage of energy consumed from renewable sources was approximately 45% in 2000. After that, it declined gradually, reaching 40% in 2007. Simultaneously, CO_2 emissions from the energy sector are trending upward in line with rising energy needs, according to the Greenhouse Gas Inventory and Monitoring, Reporting, and Verification Report of the Ministry of Environment (2022). During the period 2000-2020, energy consumption in industry (including fuel in power and heat plants, oil refineries, and coal processes) contributed the most to CO_2 emissions in the energy sector.

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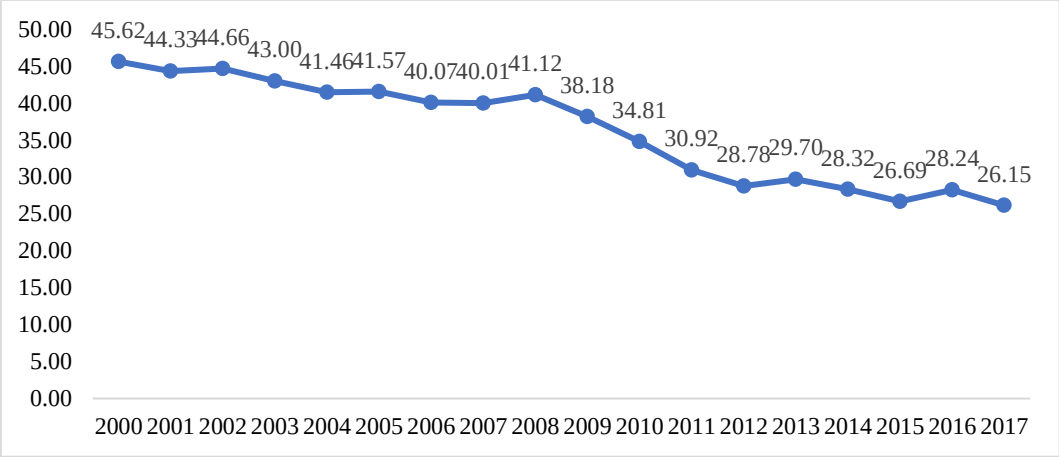

Figure 3. Share of Renewable Energy Consumption in Indonesia (% Total Energy Consumption), 2000–2017
Source: World Bank, 2022

Tourism-Related Sectors and CO_2 Emissions

The tourism industry is widely criticized for its contribution to greenhouse gas emissions, which leads to global warming (Banga et al., 2022). Tourism-related sectors, particularly hotels, restaurants, and transportation, contribute significantly to CO_2 emissions due to their heavy reliance on fossil fuels (Danish & Wang, 2018; Gössling & Peeters, 2015; Katircioğlu, 2014; Scott et al., 2016). The share of joint contributions between the hotel and restaurant sectors and transportation to national GDP shown in Figure 4 shows that the movement of share contributions between the two sectors does not form a regular pattern. However, from 2000 onward, the contribution increased until it decreased from 2006 to 2008 it decreased. Afterward, it gradually rose until 2017.

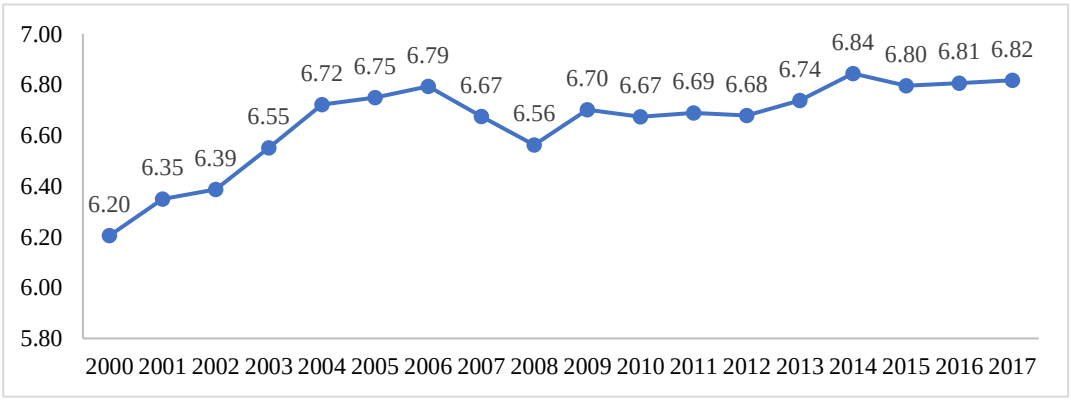

Figure 4. Share of Hotels and Restaurants Sector GDP, and Transportation, 2000 – 2017
Source: Calculations based on data from BPS, 2023

In 2016, global CO_2 emissions from transportation reached 7,230 million tons, accounting for 23% of all man-made emissions, with passenger transport accounting for 64% of the total (UNWTO & International Transport Forum, 2019). Despite improvements in fuel efficiency and greener transportation technologies, CO_2 emissions from passenger and freight transport are projected to increase by 21% by 2030, reaching 8,772 million tons, with two-thirds of passenger travel taking place in non-urban settings (UNWTO & International Transport Forum, 2019). A study by Lee and Brahmasrene (2013) revealed

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that tourism has a positive correlation with economic growth, thereby making it a substantial generator of GDP in EU countries. However, growth in tourism in EU countries is associated with increased CO_2 emissions, particularly from transportation and accommodation sectors.

Conversely, Handoyo et al. (2022) found that the interaction between FDI and imports reduces CO_2 emissions in high-income countries. This is because trade facilitates the transfer of environmentally friendly technology. Findings in lower-middle-income countries show that the lower-middle-income countries import goods and services from other countries, especially from high-income countries, the higher the level of CO_2 emissions will be.

Government Efforts to Reduce CO_2 Emissions

The Indonesian government has tried to reduce environmental impacts by promoting the use of new and renewable energy. One method taken was to implement a policy of converting kerosene into gas (liquified petroleum gas/LPG) with subsidies in 2007. The government then increased the energy sector subsidy budget in response to the growing demand for subsidies, which ultimately created a disincentive to renewable energy development because subsidized fossil fuel prices and electricity derived from fossil fuel-based make renewable energy sources less competitive, which in turn discourages people from using renewable energy.

In addition to the growth in the number of tourists and foreign exchange value, FDI in the tourism industry has become essential for the growth and development of the local tourism sector in various developing countries (Fauzel et al., 2017). Multinational companies in the tourism industry have the potential to contribute to building and strengthening the positive image of the chosen investment destination through foreign investment. For instance, establishing a foreign hotel chain in the host country might improve the reputation of the tourist destination among travelers. International tourism will also boost efficiency through competition between businesses in the country and other international tourist destinations (Fauzel et al., 2017).

Indonesia's policies have been aimed at boosting economic growth while tackling climate change and global economic challenges. Regulatory frameworks such as the 2009 Tourism Law and the 2011 National Tourism Development Master Plan (RIPK) emphasize sustainable tourism development. Since 2017, tourism has been a top priority, supported by initiatives like "Wonderful Indonesia" promoting the sector and the National Tourism Strategic Area Program (KSPN), whose indicators of success are not only assessed by physical development but also community empowerment, improving the quality of human resources, and the sustainability of development in the region (KemenkoPMK, 2020). The government has also prioritized 10 destinations for significant infrastructure development. The main goal is to replicate the model of international tourist destinations with high potential, such as Bali, throughout Indonesia. All the main tourist destination areas are spread across 10 of 34 provinces, of which four destinations are Mandalika, Tanjung Lesung, Tanjung Kelayan and have been designated as SEZs (Ollivaud & Haxton, 2019).

However, until now, the distribution of investment in Indonesia is generally still based on manufacturing, which is one of the sectors that consumes the largest energy (KLHK, 2022). According to BKPM data, around 44% of all foreign investment recorded

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by BKPM during 2009 – 2018 was in the manufacturing sector, 24% in the services sector, 20% in the primary sector, and 12% in the energy and construction sector (OECD, 2020).

CONCLUSION

FDI in the tourism industry plays an important role in the economic growth of emerging countries (Fauzel et al., 2017), including Indonesia. The country's diverse natural landscapes and cultural heritage attract both domestic and international tourists. With the growing number of tourist visits, this can attract investments. Multinational companies enhance the destination's image, for instance, by establishing hotel chains. Consequently, this encourages governments and businesses to strengthen the development of infrastructure in countries that heavily rely on tourism (Wu et al., 2022).

However, this study reveals a positive and significant correlation between investment in Indonesian tourism and CO_2 emissions. These findings suggest that Indonesia remains a pollution haven for investment. This could be the case given that the majority of capital invested in Indonesia is directed toward energy-intensive sectors, such as manufacturing, which accounted for 44% of all foreign investment from 2009 to 2018 (OECD, 2020). Moreover, the government licensing concessions aiming to attracting investments does not seem to be balanced by the enforcement of environmental conservation obligations, which is also one of the investment requirements mandated by the Investment Law. These findings highlight the need for targeted policies to address the environmental impact of tourism investments.

To address the positive correlation between investment and CO_2 emissions, policymakers should adopt a more strategic approach to tourism policy to effectively address this issue. As the regression results indicate a negative relationship between renewable energy consumption and CO_2 emissions, policymakers should enforce stricter environmental regulations by promoting renewable energy use, set higher energy efficiency standards, and provide incentives for environmental-friendly practices to acceleration the reduction of CO_2 emissions. Incentives such as tax breaks or grants can encourage businesses to adopt green practices or invest in sustainable infrastructure. Adversely, imposing higher taxes or reducing subsidies to businesses that continue to rely on fossil fuel energy sources could further drive the transition to sustainable energy sources. Additionally, implementing strong monitoring and reporting mechanisms are also crucial for tracking the environmental impact of tourism investments.

Given that the tourism-related sectors contribute significantly to greenhouse gas emissions given their heavy reliance on fossil fuels, businesses, particularly hotels, restaurants, and transportation services, should be encouraged to reduce its reliance to fossil fuel energy sources and shift to renewable energy sources. This could involve adopting solar panels, wind energy, electric vehicles, and sourcing locally to minimize ecological footprint. Eco-certification can also help businesses demonstrate their commitment to environmental responsibility, attract eco-conscious travelers, and correspond with global sustainability trends.

Investors should focus on projects that incorporate sustainability and renewable energy to mitigate the negative environmental impacts of tourism. This encourages eco-certified business and ensures that they adhere to environmental standards and sustainable practices. This approach includes supporting local businesses that provide sustainable

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products and services, such as locally sourced food, eco-friendly souvenirs, and low-impact recreational activities. Additionally, offering financial incentives for tourism businesses, such as low-interest loans, grants, or equity investments in green tourism projects can further encourage tourism businesses to adopt and maintain sustainable practices.

The current research was limited by the availability of data, covering only the period from 2000 to 2017, and focusing on the correlation between tourism investment and CO_2 emissions without considering other environmental factors, such as biodiversity loss and water pollution. To enhance the robustness, future studies might incorporate more recent data, extend the timeframe, and examine the specific types of tourism investments and their environmental impacts. Additionally, exploring the role of government policies, such as tax incentives for eco-friendly investments or carbon taxes, and investigating sustainable business practices like green certifications and carbon-neutral services, could provide valuable insights for aligning tourism development with sustainability goals.

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