ARTICLE

Ways to bring private investment to the tourism industry for green growth

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Green economic growth is a crucial subject in environmental economics over the last half-century, emphasizing the need for different economic sectors to adapt their activities based on environmental concerns. This research explores the impacts of green growth, inflation rate, economic uncertainty, green finance, and financial development on the composite indicator of sustainable tourism in 10 ASEAN economies from 2000 to 2021, utilizing the PMG (Pooled Mean Group) technique. The findings reveal that, in the short run, financial development and green finance have insignificant coefficients, while green growth exhibits the most substantial positive coefficient. Economic uncertainty and inflation rate negatively affect sustainable tourism. In the long term, green financing has the most profound impact on sustainable tourism development, along with green growth and deepening financial markets, which accelerate sustainable tourism. Conversely, economic uncertainty and inflation rate have adverse effects on the green tourism industry. Primary practical policies to promote sustainable tourism include providing a comprehensive financial policy package, developing ICT-based tourism services, establishing an early warning system, and leveraging blockchain technology and cryptocurrency in green investments, enabling governments and stakeholders to foster sustainable tourism practices and advance environmental sustainability within the ASEAN region.

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Introduction

Since the 1960s, with the development of environmental economics and green economy thinking, the concept of green economic growth has garnered attention among experts (Jiakui et al., 2023; Ren et al., 2023). During that period, rapid industrialization and population growth worldwide (Chen and Taylor, 2020) led to increased fossil fuel consumption, ringing alarm bells among environmental economists about the future of humanity on the planet. However, the warnings of environmentalists from around the world were not heeded, resulting in the emergence of the looming threat of climate change, recognized by the United Nations as the most significant peril to the future of human life. The outbreak of the COVID-19 pandemic in late 2019 and the subsequent implementation of various restrictions to curb its spread temporarily decreased carbon dioxide emissions (Kumar et al., 2020; Tu et al., 2020; Nicolini et al., 2022). Nonetheless, as economic activities resumed in 2021, carbon dioxide emissions surged dangerously. According to the EU Science Hub (2022), anthropogenic CO2 emissions in 2021 increased by nearly 5.3% compared to 2020. Experts such as Sun et al. (2023) suggest that the post-COVID-19 era presents countries with a unique opportunity to promote the idea of "recovery of green economic growth," which entails reviving economic activities in the post-pandemic era with a keen focus on environmental concerns.

Green growth recovery encompasses a wide range of policies and reforms aimed at incorporating environmental and social interests (Yoshino et al., 2021; Ren et al., 2023). Highlighted by Koasidis et al., (2022) and Shang et al. (2023), green recovery becomes a vital target for countries with environmental concerns and commitments. However, achieving the goal of restoring green economic growth in the post-COVID-19 era faces several challenges. Firstly, many countries are in a fierce competition for economic growth in the global production arena and may not be enthusiastic about investing in costly and time-consuming efforts to strengthen green economic growth. Secondly, the activation of green growth drivers requires substantial accumulated capital, which many developing countries lack. Consequently, restoring green economic growth may seem impractical from an economic and financial standpoint, leading it to remain merely a slogan or a long-term unattainable plan. Despite these challenges, examining green economic growth across different economic sectors can provide policymakers with insights into strengths and weaknesses, enabling the formulation of effective policies to attain their desired green economic growth.

The tourism industry is one of the most significant economic sectors in countries worldwide. People around the globe enjoy exploring different countries through the services offered by the tourism industry, allowing them to immerse themselves in diverse cultures, arts, and lifestyles. The tourism sector comprises various divisions, including health tourism, elderly tourism, religious tourism, and art tourism, contributing to the array of tourism services available to people from different nations. Figure 1 depicts the market size of the global tourism industry, showing an upward development trend despite the sharp decline observed at the onset of the 2019–2020 corona disease outbreak.

The COVID-19 pandemic had a profound impact on the tourism industry, resulting in a sharp collapse during the lockdowns. According to the UNWTO (UN World Tourism Organization), the tourism service sector was among the hardest-hit economic sectors during the pandemic. Numerous studies, including those by Abbas et al. (2021), Henseler et al. (2022), and Ren et al. (2023), have confirmed that travel and leisure industries were significantly harmed by COVID-19 restrictions globally. The fear surrounding the virus altered tourist behavior and mental wellbeing, leading to a reduction in domestic and international
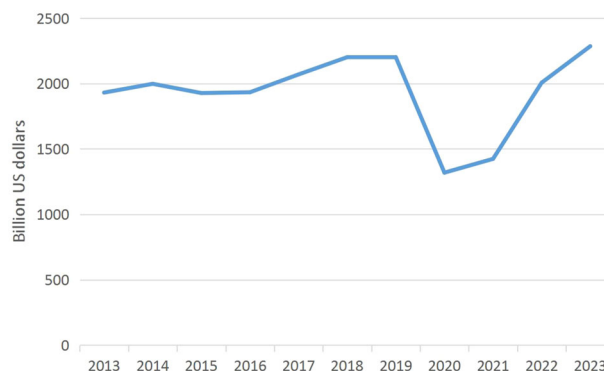

Fig. 1 Tourism industry market size, global context, 2013-2023, billion US dollars. Source: Authors from IBISWORLD (2023).

travel. However, with the threat of the pandemic subsiding due to vaccinations and the lifting of various restrictions in many countries, the tourism industry is gradually reviving. It is expected that the industry will swiftly regain its former prosperity, as indicated by studies such as that of Yu et al. (2023).

The tourism industry's contribution to green growth is known as sustainable tourism, which involves various tourism services that take into account environmental and social concerns. According to Angelkova et al. (2012), sustainable tourism is defined as an eco-friendly approach that aims to conserve and restore natural resources. Sorensn and Grindsted (2021) emphasize that sustainability in the tourism industry brings numerous benefits for biodiversity and natural resources. In this context, the tourism industry can serve as an opportunity to protect ecosystems on Earth and help countries combat issues like natural resource depletion, deforestation, and desertification. However, achieving sustainable tourism requires significant investment, which can be a limitation for many countries. Typically, governments may not have sufficient capital to invest in all environmentally friendly projects. Therefore, attracting private participation in green projects within the tourism industry becomes essential to fulfill the requirements for sustainable tourism and promote environmentally conscious practices.

In this paper, we aim to assess the impact of various variables, such as green finance and economic uncertainty index, on the sustainable tourism industry. These selected variables can have both direct and indirect effects on private participation in the sustainable tourism sector. We conduct a case study focusing on ten ASEAN countries, namely Myanmar, Indonesia, Cambodia, Vietnam, Singapore, Philippines, Malaysia, Thailand, Brunei, and Laos. The decision to study the ASEAN economies is driven by several reasons. Firstly, these countries often face capital shortages when it comes to undertaking economic projects, particularly green projects that tend to have delayed and lower returns. The Monetary Authority of Singapore (MAS) has highlighted the challenge of capital shortage within ASEAN and estimated that the member economies would require approximately 200 billion US dollars annually until 2030 to promote green investments (MAS, 2019). Moreover, the ASEAN region exhibits enormous potential for the development of sustainable tourism industries. In line with the ASEAN Tourism Strategic Plan 2016–2025, member economies are striving to establish themselves as high-quality and sustainable tourism destinations that prioritize responsibility, sustainability, and inclusivity. Additionally, ASEAN has set the Green Hotel Standard, focusing on natural resource conservation and renewable energy development. During the 22nd ASEAN Tourism Ministers meeting in 2019, there was a recognition of the need to develop sustainable tourism services, especially in polluted tourism destinations like Bali in

Indonesia, Phuket in Thailand, and Boracay in the Philippines (The ASEAN Post, 2019). By studying these aspects in the context of ASEAN countries, this research aims to shed light on the dynamics of sustainable tourism and identify potential policy measures that can further enhance private investment in the sector.

This research contributes to the existing literature in three significant ways. Firstly, it introduces a novel composite indicator of sustainable tourism, as proposed by Blancas and Lozano-Oyola (2022), which is calculated for the first time for the ASEAN economies. This indicator is incorporated as the dependent variable in the empirical model, allowing for a comprehensive assessment of sustainable tourism in the region. Secondly, the study examines the impact of green finance on the sustainable tourism indicator. As green finance has been recognized as a crucial instrument for attracting private investors (e.g., see Xu et al., 2022; Wang and Fan, 2023), analyzing its influence on sustainable tourism offers fresh insights for both scholars and policymakers in the ASEAN region. This aspect of the research delves into the role of financial mechanisms in driving sustainable practices within the tourism industry, potentially leading to more effective policies in promoting green investments and sustainable development. By addressing these aspects, this research fills gaps in the literature and contributes to a better understanding of the dynamics and determinants of sustainable tourism in the ASEAN economies. It paves the way for future studies to explore and enhance the promotion of sustainable tourism through informed policy decisions and effective utilization of green finance mechanisms.

The research structure is outlined as follows: Section "Introduction" introduces the study's focus on sustainable tourism and its contributions to the existing literature. Section "Literature review" presents a comprehensive review of earlier literature to identify gaps that this research aims to address. The theoretical foundations and concepts related to the study are discussed in Section "Theoretical background". Section "Characteristics of variables and model specification" outlines the data collection process and details the methodology employed for estimation. The empirical findings are presented and analyzed in Section "Discussion on empirical findings". Finally, Section "Conclusion and policy recommendations" concludes the study by summarizing the key insights, offering policy implications, and suggesting potential avenues for future research in the field of sustainable tourism in the ASEAN economies.

Literature review
Tourism industry and green economic growth. A considerable body of research has been dedicated to exploring the relationship between the tourism industry and green growth. For instance, Pulido-Fernández et al. (2019) examined 139 economies and found that tourism development often leads to increased pollution and environmental degradation in destinations. Ahmad et al. (2022) focused on the G7 countries from 2000 to 2019 and highlighted the positive impact of tourism expansion on sustainability and carbon emissions reduction. Xu et al. (2022) discussed the concept of tourism circular economy, emphasizing its potential to promote resource circulation and sustainability by reducing resource consumption. Conversely, Zhang et al. (2022) investigated 30 Chinese provinces and revealed that tourism significantly contributes to carbon emissions, leading to a less favorable impact on green growth. Shang et al. (2023) studied selected Asian economies from 2000 to 2021 and found that tourism positively impacts green growth in high-income countries, but adversely affects it in low-income nations. Shan and Ren (2023) explored tourism development and green energy

deployment in China from 2007 to 2020, revealing that tourism development negatively affects the sustainability of economic sectors. Guo et al. (2023) focused on 40 developing economies from 2000 to 2021, demonstrating that tourism development may promote economic growth but also increase carbon emissions. In a different study, Baloch et al., (2023) delved into sustainable ecotourism and discovered that eco-tourism is a critical factor in achieving sustainable targets, as it encourages society to demand environmentally friendly tourism services. Chen (2023) employed the NARDL model to analyze the impacts of environmental factors on China's green tourism industry, finding that sustainable tourism depends on national income, tourism policy, and green energy deployment.

Green finance and sustainable tourism industry. Another important area of research revolves around the role of green finance in the sustainable development of the tourism industry in various countries. Scholars widely agree (e.g., Yang et al. 2019; Metawa et al. 2022; Xu et al. 2023) that insufficient capital presents a primary challenge in promoting green projects, especially in the context of sustainable tourism. Private sector investment is crucial for the success of sustainable tourism initiatives. In a pioneering study, Bodlender (1982) discussed the financing of tourism projects, emphasizing the role of government in employing financial and aid tools to support the development of projects in the tourism industry. However, over the past decade, it has become evident that public sector efforts alone are insufficient for achieving sustainable development, and the active participation of the private sector in environmental projects is indispensable. Mucharreira et al. (2019) analyzed the sustainability of hotels and the impact of investment in advancing energy technologies within the hotel industry. The study concluded that investments in greening hotel energy sectors lead to reduced fossil fuel consumption, increased energy savings, and higher adoption of renewable energy sources. Lu et al. (2021) stressed the significance of investment in smart city initiatives to realize the potential of eco-tourism industry. They argued that without sufficient investment, the development of eco-tourism may not be feasible, especially for countries facing capital shortages. Shang et al. (2023) specifically focused on China and investigated the relationship between green finance and tourism development from 1992 to 2021. Their findings, using the Autoregressive Distributed Lag (ARDL) technique, confirmed that the issuance of green bonds serves as a motivator for private investors to participate in energy-efficient projects within the tourism industry. These studies collectively highlight the critical role of green finance in advancing sustainable tourism development and underscore the importance of private sector investment in driving positive environmental outcomes within the tourism sector.

Literature gap. A review of the existing literature reveals two key aspects: the growing significance of the tourism industry and its potential impact on green economic growth, and the need to attract investors for sustainable tourism projects. However, the focus on attracting investors to sustainable tourism projects in ASEAN member countries has been relatively limited in previous studies. This research aims to address this literature gap by employing a panel data model to explore the relationship between sustainable tourism industry growth and the attraction of investors in ASEAN economies. By filling this gap, the study seeks to provide valuable insights into the promotion of sustainable tourism development and its impact on green economic growth within the region.

Table 1 Variables' specifications.

Type	Variable	Symbol in model	Unit of measurement	Source of collecting
Dependent variable	Composite indicator of sustainable tourism	SUSTOU	Index	Calculated based on Blancas and Lozano-Oyola (2022)
Independent variable	Green growth index	GREENG	Index	www.Greengrowthindex.gggi.org
	Financial development	FINAND	%	World Bank
	Green finance	GREEFI	Million US dollars	Climate Bonds Initiative
	Economic uncertainty index	ECOUN	Index	www.policyuncertainty.com
	Inflation rate	INFR	%	World Bank

Source: Authors.

Theoretical background

The promotion of private investment in the sustainable tourism industry can be achieved through various channels of transmission.

First, the utilization of green financing tools like green bonds can establish a transparent and dynamic market that attracts private investors to engage in sustainable projects related to the tourism industry. Shang et al. (2023) suggest that green finance markets can facilitate capital accumulation through the involvement of private funds. Additionally, these markets offer benefits such as accessible information and transparency, which are key factors that private investors consider when participating in a project. According to Forrester's (2022) report, the size of the green finance market reached approximately 720 billion US dollars in 2021, encompassing green bonds, venture capital, green IPOs, green loans, green acquisitions, and private equity. Therefore, developing green financing markets, and specifically utilizing green bonds, can be an effective approach to attract private sector investment in sustainable tourism. The second transmission channel is the condition of economic uncertainty. Nagar et al. (2019) highlight the significance of economic policy uncertainty on investors' behavior and decisions. Economic uncertainty, synonymous with risk, is considered unfavorable for private sector investors' participation. Private investors are highly concerned about their capital and the return on investment, thus in economies with high uncertainty, where the future is unpredictable, they are less inclined to engage. The presence of green literacy in society is another influential channel. As green literacy develops in society, private sector investors also become more attentive to ESG (Environment, Social, and Governance) investing, which positively impacts their inclination to participate in projects related to sustainable tourism. Another critical channel is the financial development of the host country. With the development of financial markets, private sector investors find it more convenient and accessible to conduct monetary and financial operations within the country, which increases their willingness to participate in green projects in the field of sustainable tourism. Additionally, the green economic growth of the host country (Wang et al. 2021) plays a significant role. When a country's green economy develops, private sector investors recognize the importance of sustainable development and perceive green projects as profitable and justified. Consequently, their desire to engage in environmentally friendly tourism projects increases. Moreover, the inflation rate is a crucial factor previously addressed by studies like Sohani et al. (2022) as an impactful variable influencing the promotion or inhibition of sustainable projects. High inflation rates act as a deterrent for private sector investors, as the rising cost of goods and services increases the expenses associated with investment. This leads to a decrease in the private sector's inclination to participate in costly projects.

In conclusion, the private investment in the sustainable tourism industry is fundamentally influenced by several key factors.

These factors include green economic growth, financial development, green finance, economic uncertainty, and inflation rate. Each of these variables plays a significant role in shaping the private sector's willingness to invest in environmentally friendly projects within the tourism sector. By understanding and addressing the impact of these factors, policymakers and stakeholders can effectively foster private sector participation and drive sustainable development in the tourism industry.

Characteristics of variables and model specification

In this research, 10 ASEAN economies were selected to measure the impacts of independent variables on the dependent variable. Data for the variables were gathered from domestic and international databases for the period of 2000–2021, resulting in 220 observations. Due to the lack of data for the variable of private sector investment in sustainable tourism, a proxy was used, which is the composite indicator of sustainable tourism proposed by Blancas and Lozano-Oyola (2022), calculated for the examined ASEAN countries. The independent variables were determined based on the theoretical background and include the green growth index, financial development (domestic credit to the private as a percentage of GDP) proposed by Bekana (2023), green finance, economic uncertainty index, and inflation rate. The characteristics of the selected variables are presented in Table 1.

The estimation of coefficients for the independent variables follows a structured process. The first step involves testing the existence of cross-sectional dependency (CD) among the cross-section units of the ASEAN countries panel. For this purpose, the Pesaran and Smith (1995) cross-sectional dependency test is employed. If the CD test confirms the presence of cross-sectional dependency, the second generation of panel unit root tests is more appropriate. In this regard, the CIPS (cross-sectionally augmented IPS) test is utilized to determine the order of integration of the selected variables. The next step entails conducting the panel co-integration test using the Westerlund (2007) ECM technique to ascertain whether the variables are cointegrated in the long term. As a robustness check, the Pedroni (2004) panel co-integration test is performed to ensure the reliability of the panel co-integration test results. The subsequent step includes the Hausman test to study the long-term homogeneity of the variables, followed by estimation using the Pooled Mean Group (PMG) technique. This comprehensive approach ensures a rigorous analysis of the relationships between the independent variables and the dependent variable in the context of the ASEAN countries panel.

Discussion on empirical findings

Table 2 presents the results of the cross-sectional dependency test. It confirms the presence of cross-sectional dependency in all the series".

Table 2 Results of cross-sectional dependency test.

Variable	CD test	Prob.	Corr.	Abs (Corr.)
SUSTOU	34.593	0.000	0.14	0.43
GREENG	57.211	0.004	0.26	0.43
FINAND	115.492	0.000	0.39	0.41
GREEFI	138.584	0.003	0.58	0.59
ECOUN	44.388	0.001	0.25	0.50
INFR	74,110	0.004	0.45	0.51

SUSTOU, GREENG, FINAND, GREEFI, ECOUN, and INFR stand for Composite indicator of sustainable tourism, Green growth index, Financial development, Green finance, Economic uncertainty index, and Inflation rate, respectively.
Source: Authors.

Table 3 Results of CIPS test.

Variable	Level		First difference	
	t-stat	Prob.	t-stat	Prob.
SUSTOU	1.583	1.000	−8.494	0.000
GREENG	0.775	0.583	−6.179	0.003
FINAND	1.039	0.998	−8.054	0.009
GREEFI	0.778	0.684	−6.586	0.000
ECOUN	0.029	0.890	−6.506	0.000
INFR	1.019	1.000	−9.049	0.000

SUSTOU, GREENG, FINAND, GREEFI, ECOUN, and INFR stand for Composite indicator of sustainable tourism, Green growth index, Financial development, Green finance, Economic uncertainty index, and Inflation rate, respectively.
Source: Authors.

Table 4 Results of Westerlund panel co-integration technique.

-	Statistic	Prob.
G_a	−4.392	0.049
G_t	−7.942	0.002
P_a	−13.108	0.019
P_t	−9.057	0.003

Source: Authors.

Table 5 Results of Pedroni panel co-integration test (Robustness check).

-	Statistic	Prob.
Panel v-stat	1.66	0.03
Panel σ-stat	−9.04	0.00
Panel pp-stat	−20.48	0.04
Panel ADF- stat	−26.69	0.00
Group σ-stat	−0.59	0.25
Group pp-stat	−16.54	0.00
Group ADF- stat	−11.05	0.01

Source: Authors.

Due to the presence of cross-sectional dependency in the panel of ASEAN economies, the second generation of panel unit root tests is conducted to check the stationarity of the selected variables. Table 3 presents the results of the stationary tests for the variables.

Based on the results presented in Table 3, it can be observed that all the variables are non-stationary at levels but become stationary at I (1). The next step involves assessing the existence

Table 6 Results of Hausman test (Long term homogeneity check).

-	Mean Group	Pooled Mean Group	Diffrerence
GREENG	−0.14	−0.09	−0.05
FINAND	2.45	0.61	1.84
GREEFI	−0.05	0.00	0.05
ECOUN	−0.21	−0.19	−0.02
INFR	0.68	0.31	0.47

GREENG, FINAND, GREEFI, ECOUN, and INFR stand for Green growth index, Financial development, Green finance, Economic uncertainty index, and Inflation rate, respectively.
Source: Authors.

Table 7 Results of Pooled Mean Group Technique (PMGT).

Independent variable	Short term	Long term
GREENG	0.439 (0.08)	0.129 (0.00)
FINAND	0.102 (0.19)	0.094 (0.03)
GREEFI	0.039 (0.24)	0.493 (0.00)
ECOUN	−0.102 (0.05)	−0.329 (0.06)
INFR	−0.093 (0.00)	−0.168 (0.04)

Note 1: GREENG, FINAND, GREEFI, ECOUN, and INFR stand for Green growth index, Financial development, Green finance, Economic uncertainty index, and Inflation rate, respectively.
Note 2: Numbers in () indicate p values.
Source: Authors.

of a long-term relationship among the variables through the Westerlund and Pedroni panel co-integration tests (Tables 4, 5, respectively).

The findings presented in Table 4 provide confirmation that there is indeed a long-term association among the variables. Moreover, the robustness check results in Table 5 further support the initial finding that the variables are co-integrated in the long term (Table 6).

According to the Hausman test, the PMG technique emerges as the most suitable estimator for assessing the short-term and long-term effects of the independent variables on the composite indicator of sustainable tourism in the ASEAN economies. The estimation results of the PMG technique are presented in Table 7 as follows:

According to the obtained results, green economic growth is a significant factor promoting sustainable tourism and investment in ASEAN member countries, both in the short term and long term. A 1% increase in the green economic growth index leads to a development of sustainable tourism in the studied countries by 0.49% in the short term and 0.12% in the long term. This finding supports earlier studies like Ahmad et al. (2022), Xu et al. (2022), and Shang et al. (2023), which emphasized the association between eco-tourism and green economic flourishing. By fostering green economic growth, environmentally friendly projects gain higher value in the minds of private sector investors, creating a capacity for developing various green economic sectors, such as sustainable tourism.

The variable of financial market development has a significant positive effect, but only in the long term. A 1% increase in the financial development variable improves sustainable tourism and investment in the industry by 0.09% in the long run. Deepening financial markets in ASEAN can help private investors find investments in environmental projects easier and more transparent. This finding aligns with Wang et al. (2021), who declared that financial markets have a direct positive impact on green tourism development. Green financing also positively influences sustainable tourism in ASEAN countries, but its effect is only

Table 8 Robustness check (FMOLS estimation).

Independent variable	Coefficient	P value
GREENG	0.114	0.00
FINAND	0.072	0.03
GREEFI	0.389	0.02
ECOUN	−0.019	0.00
INFR	−0.368	0.01

GREENG, FINAND, GREEFI, ECOUN, and INFR stand for Green growth index, Financial development, Green finance, Economic uncertainty index, and Inflation rate, respectively.
Source: Authors.

significant in the long term, with an insignificant coefficient in the short term. Green financing tools can finance or refinance investment projects in sustainable tourism, enabling capital-raising for these projects. This result is in line with Shang et al. (2023), who depicted the positive role of green financing in promoting green projects. On the other hand, economic uncertainty has an adverse effect on the development of sustainable tourism in both the short term and long term. This finding supports earlier studies like Nagar et al. (2019) and Rasoulinezhad (2020), who expressed that economic uncertainty disrupts the flow of investment in various economic projects. In green projects, which usually do not yield high and fast returns, uncertainty leads to the decision of non-participation of private sector investors. Furthermore, the inflation rate acts as an inhibiting factor in promoting sustainable tourism in the short and long term in ASEAN member countries. The increase in the general level of the price of goods and services directly affects the price of environmentally friendly projects, discouraging private sector investors from participating in sustainable tourism projects.

Based on the empirical findings, it can be discussed that in the short term, green economic growth is the most effective variable in attracting private sector investment in sustainable tourism projects, while in the long term, the most influential factor is the green financing tool. These insights offer valuable information for policymakers and stakeholders in formulating effective strategies to foster sustainable tourism and attract private investments in the field.

To verify the reliability of the empirical estimations, a robustness check is performed using the Fully Modified OLS (FMOLS) technique. The results, presented in Table 8, confirm the validity of the empirical estimations previously reported in Table 7.

Conclusion and policy recommendations

Green economic growth has been a prominent topic in environmental economics for the past fifty years. Within the context of green economic growth, various economic sectors are urged to modify and redefine their activities to align with environmental concerns, thereby fostering sustainable development within the broader macro economy. This research examines the impacts of green growth, inflation rate, economic uncertainty, green finance, and financial development on the Composite indicator of sustainable tourism in 10 ASEAN economies from 2000 to 2021, utilizing the PMG estimation technique. The empirical findings reveal that private investment in sustainable tourism projects is influenced by different variables in both the short- and long-term perspectives. In the short-run, financial development and green finance exhibit insignificant coefficients, while green growth shows the largest positive coefficient, indicating that private investors are driven by immediate green economic growth incentives. Moreover, economic uncertainty and inflation rate have adverse effects on sustainable tourism in the short-term within the ASEAN countries. Moving on to the long-term

estimated coefficients, all explanatory variables demonstrate significance. Notably, the most profound long-term impact is attributed to green financing, fostering sustainable tourism development. Additionally, green growth and the deepening of financial markets accelerate sustainable tourism in the long term. Conversely, economic uncertainty and inflation rate have detrimental effects on the green tourism industry in the long term. These findings provide valuable insights for policymakers and stakeholders aiming to promote sustainable tourism development in the ASEAN region.

The research findings highlight the importance for ASEAN countries to formulate policies that foster a positive relationship between financial markets and green financing to attract private sector capital for sustainable tourism projects in the short term. Implementing an effective financial policy package, including tax exemptions, preferential interest rates for green deposits, and green subsidy payments, by the governments of ASEAN countries is a viable approach to achieve this objective. Additionally, investing in Information and Communication Technology (ICT) within the tourism industry, such as developing online tourist services and creating virtual tourism experiences, represents another crucial applied policy for ASEAN countries. Embracing ICT-based tourism services provides an eco-friendly alternative to traditional tourism practices that may harm the environment. Furthermore, establishing an early warning system across various economic sectors in ASEAN countries can be an effective practical policy to intelligently prevent internal economic and financial crises that may lead to uncertainty and inflation. Moreover, the development of the cryptocurrency market can play a significant role in private sector investments in sustainable tourism within ASEAN member countries. Embracing blockchain technology and cryptocurrency in green investments can facilitate the accumulation of capital for environmentally friendly projects, further promoting sustainable tourism in the region.

In the future, researchers have the opportunity to explore the impact of the corona disease on investments in environmentally friendly projects. The pandemic has not only had significant medical consequences but has also brought about substantial changes in sustainable development and altered economic consumption patterns in various countries. Understanding how the corona disease has influenced private sector investment in eco-tourism projects can provide valuable insights for policymakers. Additionally, conducting country-level analyses within ASEAN to examine the factors that affect the attraction of private sector investment in ecotourism projects can yield more precise and practical results, enabling policymakers to tailor their strategies to the unique circumstances of each country within the region. Such future research endeavors can contribute to the advancement of sustainable tourism and green economic growth in the ASEAN region.

Data availability

Our analysis of the included articles scoping is available in the Supplementary file.

References

Abbas J, Mubeen R, Lorembr P, Raza S, Mamirkulova G (2021) Exploring the impact of COVID-19 on tourism: transformational potential and implications for a sustainable recovery of the travel and leisure industry. Curr Res Behav Sci 2:100033. https://doi.org/10.1016/j.crbeha.2021.100033

Ahmad N, Youjin L, Hdia M (2022) The role of innovation and tourism in sustainability: why is environment-friendly tourism necessary for entrepreneurship? J Cleaner Prod 379(Part 2):137799. https://doi.org/10.1016/j.jclepro.2022.134799

Angelkova T, Koteski C, Jakovlev Z, Mitrevska E (2012) Sustainability and competitiveness of tourism. Procedia- Soc Behav Sci 44:221–227

Baloch Q, Shah S, Iqbal N, Sheeraz M, Asadullah M, Mahar S, Khan A (2023) Impact of tourism development upon environmental sustainability: a suggested framework for sustainable ecotourism. Environ Sci Pollut Res 30:5917–5930

Bekana D (2023) Governance quality and financial development in Africa. World Dev Sustainability 2:100044. https://doi.org/10.1016/j.wds.2023.100044

Blancas F, Lozano- Oyola M (2022) Sustainable tourism evaluation using a composite indicator with different compensatory levels. Environ Impact Assessment Rev 93:106733. https://doi.org/10.1016/j.eiar.2021.106733

Bodlender J (1982) The financing of tourism projects. Tourism Manag 3(4):277–284

Chen Q (2023) The impact of economic and environmental factors and tourism policies on the sustainability of tourism growth in China: evidence using novel NARDL model. Environ Sci Pollut Res 30:19326–19341

Chen Q, Taylor D (2020) Economic development and pollution emissions in Singapore: Evidence in support of the Environmental Kuznets Curve hypothesis and its implications for regional sustainability. J Cleaner Prod 243:118637. https://doi.org/10.1016/j.jclepro.2019.118637

EU Science Hub (2022) Global CO_2 emissions rebound in 2021 after temporary reduction during COVID lockdown. URL: https://joint-research-centre.ec.europa.eu/jrc-news/global-co2-emissions-rebound-2021-after-temporary-reduction-during-covid19-lockdown-2022-10-14_en [accessed 14.03. 2023]

Forrester (2022) Global Green Finance Saw Record Growth in 2021. URL: www.forrester.come [accessed 10.03. 2023]

Guo Y, Zhao L, Zhang C (2023) Energy resources, tourism development and growth-emission nexus in developing countries. Resources Policy 81:103407. https://doi.org/10.1016/j.resourpol.2023.103407

Henseler M, Maisonnave H, Maskaeva A (2022) Economic impacts of COVID-19 on the tourism sector in Tanzania. Annals Tourism Res Empirical Insights 3(1):100042. https://doi.org/10.1016/j.annale.2022.100042

IBISWORLD. 2023. Global Tourism- Market Size. URL: https://www.ibisworld.com/global/market-size/global-tourism/ [accessed 10.03. 2023]

Jiakui C, Abbas J, Najam H, Liu J, Abbas J (2023) Green technological innovation, green finance, and financial development and their role in green total factor productivity: Empirical insights from China. J Cleaner Prod 382:135131. https://doi.org/10.1016/j.jclepro.2022.135131

Koasidis K, Nikas A, de Ven D, Xexekis G, Forouli A, Mittal S, Gambhir A, Koutsellis T, Doukas H (2022) Towards a green recovery in the EU: Aligning further emissions reductions with short- and long-term energy-sector employment gains. Energy Policy 171:113301. https://doi.org/10.1016/j.enpol.2022.113301

Kumar P, Hamma S, Omivarborna H, Sharma A, Sahani J, Abhijith K, Debele S, Zavala- Reyes J, Barwise Y, Tiwari A (2020) Temporary reduction in fine particulate matter due to 'anthropogenic emissions switch-off' during COVID-19 lockdown in Indian cities. Sustain Cities Soc 62:102382. https://doi.org/10.1016/j.scs.2020.102382

Lu C, Huang J, Chen C, Shu M, Hsu C, Bapu B (2021) An energy-efficient smart city for sustainable green tourism industry. Sustain Energy Technol Assessments 47:101494. https://doi.org/10.1016/j.seta.2021.101494

MAS. 2019. New US$2 billion Investments Programme to Support Growth of Green Finance in Singapore. URL: https://www.mas.gov.sg/news/media-releases/2019/new-us$2-billion-investments-programme-to-support-growth-of-green-finance-in-singapore [accessed 10.03 .2023]

Metawa N, Dogan E, Taskin D (2022) Analyzing the nexus of green economy, clean and financial technology. Econ Anal Policy 76:385–396

Mucharreira P, Antunes M, Abranja N, Justino M, Quiros J (2019) The relevance of tourism in financial sustainability of hotels. Eur Res Manag Bus Econ 25(3):165–174

Nagar V, Schoenfeld J, Wellman L (2019) The effect of economic policy uncertainty on investor information asymmetry and management disclosures. J Account Econ 67(1):36–57

Nicolini G, Antoniella G, Carotenuto F, Christen A, Ciais P, Feigennwinter C, Gioli B, Stagakis S, Velasco E, Vogt R, Ward H, Barlow J, Chrysoulakis N, Duce P, Graus M, Helfter C, Heusinkveld B, Jarvi L, Karl T, Marras S, Papale D (2022) Direct observations of CO_2 emission reductions due to COVID-19 lockdown across European urban districts. Sci Total Environ 830:154662. https://doi.org/10.1016/j.scitotenv.2022.154662

Pedroni P (2004) Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econ Theory 20:597–625

Pesaran MH, Smith R (1995) Estimating long-run relationships from dynamic heterogeneous panels. J Econ 68:79–113

Pulido- Fernandez J, Cardenas- Garcia P, Espinosa- Pulido J (2019) Does environmental sustainability contribute to tourism growth? An analysis at the country level. J Cleaner Prod 213:309–319

Rasoulinezhad E (2020) Environmental impact assessment analysis in the Kahak's Wind Farm. J Environ Assessment Policy Manag 22(01):2250006. https://doi.org/10.1142/S1464333222500065

Ren X, Li J, He F, Lucey B (2023) Impact of climate policy uncertainty on traditional energy and green markets: Evidence from time-varying granger tests. Renew Sustain Energy Rev 173:113058. https://doi.org/10.1016/j.rser.2022.113058

Ren X, Zeng G, Zhao Y (2023) Digital finance and corporate ESG performance: Empirical evidence from listed companies in China. Pacific- Basin Finance J 79:102019. https://doi.org/10.1016/j.pacfin.2023.102019

Ren X, Zeng G, Dong K, Wang K (2023) How does high-speed rail affect tourism development? The case of the Sichuan-Chongqing Economic Circle. Transp Res Part A: Policy Pract 169:103588. https://doi.org/10.1016/j.tra.2023.103588

Sun X, Xiao S, Ren X, Xu B (2023) Time-varying impact of information and communication technology on carbon emissions. Energy Econ 118:106492. https://doi.org/10.1016/j.eneco.2022.106492

Shan Y, Ren Z (2023) Does tourism development and renewable energy consumption drive high quality economic development? Resources Policy 80:103270. https://doi.org/10.1016/j.resourpol.2022.103270

Shang Y, Lian Y, Chen H, Qian F (2023) The impacts of energy resource and tourism on green growth: Evidence from Asian economies. Resources Policy 81:103359. https://doi.org/10.1016/j.resourpol.2023.103359

Shang Y, Zhu L, Qian F, Xie Y (2023) Role of green finance in renewable energy development in the tourism sector. Renewable Energy 206:890–896

Sorensen F, Grindstd T (2021) Sustainability approaches and nature tourism development. Ann Tourism Res 91:103307. https://doi.org/10.1016/j.annals.2021.103307

Sohani, A, Delfani, F, Hosseini, M, Sayyadi, H, Karimi, N, Li, L, and Doranehgard, M (2022) Price inflation effects on a solar-geothermal system for combined production of hydrogen, power, freshwater and heat. Int J Hydrogen Energy, In Press, https://doi.org/10.1016/j.ijhydene.2022.04.130

The ASEAN Post. 2019. Towards sustainable tourism in ASEAN. URL: https://theaseanpost.com/article/towards-sustainable-tourism-asean [accessed 12.03.2023]

Tu C, Rasoulinezhad E, Sarker T (2020) Investigating solutions for the development of a green bond market: Evidence from analytic hierarchy process. Finance Res Lett 34:101457. https://doi.org/10.1016/j.frl.2020.101457

Wang M, Zhang X, Hu Y (2021) The green spillover effect of the inward foreign direct investment: Market versus innovation. J Cleaner Prod 328:129501. https://doi.org/10.1016/j.jclepro.2021.129501

Wang Q, Fan Z (2023) Green finance and investment behavior of renewable energy enterprises: A case study of China. Int Rev Financial Anal 87:102564. https://doi.org/10.1016/j.irfa.2023.102564

Westerlund J (2007) Testing for error correction in panel data. Oxf Bull Econ Stat 69:709–748

Xu A, Wang C, Tang D, Ye W (2022) Tourism circular economy: Identification and measurement of tourism industry ecologization. Ecol Indicat 144:109476. https://doi.org/10.1016/j.ecolind.2022.109476

Xu J, She S, Gao P, Sun Y (2023) Role of green finance in resource efficiency and green economic growth. Resources Policy 81:103349. https://doi.org/10.1016/j.resourpol.2023.103349

Yang D, Chen Z, Yang Y, Nie P (2019) Green financial policies and capital flows. Phys A Stat Mech Appl 522:135–146

Yoshino N, Rasoulinezhad E, Taghizadeh-Hesary F (2021) Economic impacts of carbon tax in a general equilibrium framework: Empirical Study of Japan. J Environ Assessment Policy Manag 23(01n02):2250014. https://doi.org/10.1142/S1464333222500144

Yu L, Zhao P, Tang J, Pang L (2023) Changes in tourist mobility after COVID-19 outbreaks. Ann Tourism Res 98:103522. https://doi.org/10.1016/j.annals.2022.103522

Zhang X, Guo W, Bashir M (2022) Inclusive green growth and development of the high-quality tourism industry in China: The dependence on imports. Sustain Prod Consumption 29:57–78

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Author contributions

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Competing interests

The authors declare no competing interests.

Informed consent

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