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Tourism Inflows and Renewable Electricity Transition in Southeast and East Asian Economies: Within-Country Evidence, 2000–2019

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ABSTRACT: Tourism growth is often assumed to accelerate renewable-energy adoption, yet observed relationships may reflect persistent differences among countries rather than changes within them. This study tests whether international tourist arrivals predict the renewable share of electricity generation in a balanced panel of Cambodia, China, Lao PDR, Malaysia, Myanmar, the Philippines, and Singapore from 2000 to 2019 (N = 140). Pooled correlations are compared with two-way country and year fixed-effects regressions controlling for GDP per capita and population. The pooled association is negative ($r = -0.562$), largely reflecting contrasts between hydropower-rich, lower-tourism economies and tourism-intensive economies with limited domestic renewable generation. After fixed effects are introduced, tourism coefficients are statistically insignificant across linear, extended, and non-linear specifications. The results indicate that annual tourism growth does not systematically alter national electricity composition; renewable transition appears more closely tied to structural endowment, energy policy, and investment conditions.

Keywords: international tourism; renewable electricity; energy transition; panel fixed effects; Southeast Asia; East Asia

INTRODUCTION

International tourism and electricity-sector decarbonisation are increasingly intertwined policy concerns in Southeast and East Asia. Before the COVID-19 disruption, ASEAN received 143.5 million international tourist arrivals in 2019, following sustained growth during the preceding decade (ASEAN Secretariat, 2021). At the same time, governments across Southeast Asia were pursuing regional aspirations to raise renewable energy to 23% of total primary energy supply and 35% of installed power capacity by 2025 (ASEAN Centre for Energy, 2021). The energy challenge has become more demanding as electricity use expands rapidly: the International Energy Agency projects that regional electricity demand will continue growing faster than total energy demand, while coal and natural gas remain important components of the generation mix (IEA, 2024). Tourism therefore develops within an energy system undergoing transition, but it is not self-evident that more visitors cause that transition to accelerate.

Several mechanisms nevertheless support a positive tourism-renewable energy relationship. Tourism receipts can expand the fiscal and commercial resources available for clean infrastructure; hotels and destinations may adopt renewable electricity to reduce operating costs, meet environmental certification standards, and strengthen green branding; and green finance can lower the cost of capital for tourism-related energy projects (Chen et al., 2025; Guo & Chai, 2025). Yet the opposite mechanism is equally plausible. Visitor growth increases demand for air transport, cooling, accommodation, mobility, and other energy-intensive services, and the marginal electricity required to serve that demand may be generated from fossil fuels where renewable deployment, grids, finance, or regulation lag behind demand growth (Deka et al., 2024; IEA, 2024). Tourism can thus create an incentive for renewable investment without guaranteeing that national electricity composition will change.

Empirical research has not resolved this ambiguity. Studies of Asian and OECD economies often identify significant relationships among tourism, renewable energy consumption, economic growth, and carbon emissions (Dogru et al., 2020; Zhang & Liu, 2019). Other panel studies conclude that renewable energy can moderate tourism-related environmental pressure (Banga et al., 2022), while recent work reports heterogeneous, non-linear, or context-specific effects (Deka et al., 2024; Voumik et al., 2024; Zhang et al., 2023). Much of this literature, however, explains emissions, ecological footprint, total energy use, or renewable energy consumption rather than the renewable share of electricity generation. Moreover, cointegration, pooled, and mean-group estimators may combine variation across countries with changes within countries. That distinction matters when the policy question is whether a rise in tourist arrivals in a particular country is followed by a change in that country's electricity mix.

Southeast and East Asia provide a demanding setting in which to separate these sources of variation. Renewable electricity shares differ sharply because of geography, inherited generation assets, grid structure, energy security priorities, and institutional capacity. Hydropower-rich economies in the Greater Mekong subregion can display high renewable shares even when their tourism markets are comparatively small, whereas city-states and highly urbanised economies may attract many visitors while possessing limited domestic renewable resources. Spatial assessments confirm that solar, wind, and hydropower potential is distributed unevenly across Southeast Asia (Sakti et al., 2023), and recent ASEAN evidence emphasises governance, innovation, capital formation, and macroeconomic conditions as determinants of renewable generation (Pinjaman et al., 2025). A pooled correlation can therefore attribute to tourism what is actually produced by fixed structural differences.

This study asks: are annual changes in international tourist arrivals associated with changes in the renewable share of electricity generation within Southeast and East Asian economies? It uses a balanced panel of seven economies from 2000 to 2019 and compares the raw pooled relationship with two-way fixed-effects estimates that absorb time-invariant country characteristics and common year shocks. The design is associational rather than causal: fixed effects remove stable unobserved heterogeneity, but they do not eliminate all time-varying confounding or reverse causality. The objective is therefore to estimate a more policy-relevant within-country association and to show how it differs from the cross-country pattern.

The paper makes three contributions. First, it shifts attention from emissions and aggregate renewable consumption to renewable electricity share, an outcome directly connected to generation planning and power-sector policy. Second, it makes the between-country/within-country distinction explicit in a region where resource endowment creates unusually large cross-sectional differences. Third, it provides a methodological caution for sustainable tourism research: a statistically visible cross-country relationship need not imply that tourism growth produces an energy transition within destination economies. The remainder of the paper develops the theoretical expectations, describes the data and empirical strategy, reports the results, and discusses their policy and research implications.

LITERATURE REVIEW

Theoretical Foundations: Growth, Tourism, and the Environmental Kuznets Curve

The Environmental Kuznets Curve (EKC) proposes that environmental pressure may initially rise with income and decline after development reaches a level at which cleaner technology, regulation, and public demand for environmental quality become stronger (Grossman & Krueger, 1995). Applied to tourism, the framework distinguishes scale, composition, and technique effects. The scale effect increases transport, accommodation, electricity, and material demand. The composition effect depends on the kinds of tourism activities and industries that expand. The technique effect emerges when higher incomes, cleaner technologies, and stricter standards reduce environmental intensity. Tourism-induced EKC studies consequently report linear, inverted-U, and other non-linear relationships, depending on the country, environmental indicator, and estimation method (Katircioğlu, 2014; Kongbuamai et al., 2020; Zaman et al., 2016).

The EKC is informative but does not imply that renewable electricity adoption follows automatically from tourism growth. Emissions may decline because of efficiency improvements, structural change, or imported electricity even when the domestic renewable share is unchanged. Conversely, a renewable share may rise because of hydropower commissioning or national energy policy without any tourism-related mechanism. Renewable electricity is therefore better treated as a specific policy and infrastructure outcome than as a direct proxy for general environmental quality. This distinction motivates an empirical model that conditions on development and removes fixed country characteristics.

Tourism and Renewable Energy: Empirical Evidence

Four main channels connect tourism to renewable energy. First, tourism income may help finance electricity and destination infrastructure. Second, environmental branding and certification can increase demand for renewable electricity among hotels, resorts, transport providers, and public facilities. Third, green finance and technological innovation may lower the cost of tourism-related renewable projects. Fourth, tourism raises total energy demand, which can be met by either renewable or fossil generation depending on national policy, resource availability, and grid conditions (Chen et al., 2025; Guo & Chai, 2025). The net effect is consequently an empirical question rather than a theoretical certainty.

The available evidence is mixed. Zhang and Liu (2019) show that international tourism and renewable energy are jointly relevant to environmental outcomes in Asian countries. Dogru et al. (2020) identify interdependence among tourism, economic growth, renewable energy consumption, and emissions in OECD economies, but country-level effects are heterogeneous. Banga et al. (2022) find that clean energy can mitigate pollution associated with tourism development, whereas Shang et al. (2023) link tourism and energy-resource conditions to green growth in Asian economies. More recently, Deka et al. (2024) report that energy efficiency and renewable energy are more consistent environmental predictors than tourist arrivals in Sub-Saharan Africa, while Zhang et al. (2023) emphasise a non-linear co-evolution between renewable transition and sustainable tourism. These findings support plausible interaction, but not a universal positive tourism effect.

Three methodological features limit direct comparison with the present study. First, many studies use carbon emissions, ecological footprint, or renewable energy consumption rather than the renewable share of electricity generation. Second, long-run cointegration and mean-group estimators answer different questions from a within-country fixed-effects model. Third, broad international panels may allow cross-sectional differences in resource endowment and development to drive the estimated relationship. A fixed-effects design is particularly valuable where the purpose is to test whether annual tourism changes are associated with annual changes in the national electricity mix.

Determinants of Renewable Electricity Transition in Southeast and East Asia

Renewable electricity transition in Southeast and East Asia is shaped by natural endowment, inherited generation assets, grid capacity, investment costs, energy-security objectives, and policy credibility. Hydropower remains central in parts of the Greater Mekong subregion, while solar, wind, and geothermal resources are substantial but unevenly developed (Sakti et al., 2023). The IEA (2024) notes that renewable generation is expanding, but electricity demand and fossil generation also continue to grow, making grid investment, flexibility, and financing decisive. These features imply that two countries with similar tourism growth can follow very different electricity pathways.

Macroeconomic and institutional research reinforces this interpretation. Financial development can ease the high up-front financing requirements of renewable infrastructure, while governance quality and innovation influence project implementation and investor confidence. Pinjaman et al. (2025) identify governance, innovation, and macroeconomic conditions as relevant to renewable generation across ASEAN. Country studies also show that development, urbanisation, trade, and energy structure shape emissions and energy outcomes in Malaysia and Far East Asia (Ang, 2008; Anwar et al., 2020). Electricity-sector analyses further indicate that generation-mix decisions explain much of the variation in ASEAN power-sector emissions (Voumik et al., 2022). Tourism may influence electricity demand, but these structural and institutional factors determine how that demand is supplied.

Tourism and Economic Growth in ASEAN: The Broader Context

The tourism-led growth hypothesis provides a broader macroeconomic rationale for expecting tourism to affect energy transition. Tourism can generate foreign exchange, employment, investment, tax revenue, and infrastructure spillovers, which may increase a government's and private sector's capacity to finance cleaner energy. Evidence for Malaysia and ASEAN generally confirms that tourism and growth are connected, although the direction and strength of causality vary across countries and periods (Kadir & Karim, 2012;

Tang & Tan, 2013, 2015). Lin et al. (2019) similarly show that tourism-led growth and economy-driven tourism growth occur under different structural conditions.

Recent evidence remains cautious about a single regional pattern. Fan and Ha (2025) find that tourism-growth relationships in Southeast Asia are heterogeneous and that economic growth can be an important driver of tourism, not only the reverse. This matters for the present study because a tourism-growth correlation does not establish a tourism-led electricity transition. Additional income must be transmitted through public investment, financial markets, regulation, utility planning, or firm procurement before it can alter the renewable share. The tourism-led growth literature therefore supplies a possible indirect channel, but not evidence that the environmental or energy effect is automatic.

Theoretical Foundations of Sustainable and Green Tourism

Sustainable tourism extends the sustainable-development principle to a sector whose economic benefits depend on the long-run integrity of environmental and social resources. The Triple Bottom Line framework treats economic, social, and environmental performance as distinct but interdependent objectives (Stoddard et al., 2012). From this perspective, visitor growth represents economic performance, whereas renewable electricity is one component of environmental performance. Progress in one pillar cannot be assumed to produce progress in another without governance and investment choices.

Stakeholder and governance perspectives make this conditionality more explicit. Tourism firms, utilities, financial institutions, local communities, and national and local governments control different parts of the transition. Recent cross-country evidence on tourism sustainability shows that institutional and policy conditions shape whether tourism development produces environmental gains (Trstenjak et al., 2025). Green-tourism research likewise stresses that renewable energy becomes consequential when it is embedded in financing, procurement, infrastructure, and destination management rather than treated as a symbolic attribute (Guo & Chai, 2025). A null national-level association between arrivals and renewable share is therefore consistent with sustainable-tourism theory when environmental improvements require deliberate coordination.

Sustainable and Green Tourism in Indonesia

Indonesia illustrates the difference between destination-level sustainability and national electricity transition. Bali has long served as a prominent case of efforts to move a tourism-dependent economy towards greener development, yet institutional fragmentation, infrastructure constraints, and implementation capacity limit the translation of policy ambition into system-wide change (Law et al., 2016). OECD (2019) similarly emphasises that more sustainable regional tourism development in Indonesia depends on coordinated planning, infrastructure, skills, and local governance. At the same time, Indonesia's renewable energy transition faces broader challenges involving regulation, investment, grid readiness, and the gap between resource potential and realised capacity (Pambudi et al., 2023).

Local tourism research shows that communities and destination organisations can improve resource management and sustainability practices even when national energy indicators change slowly. Evidence from Bali tourism villages, for example, highlights the importance of local institutions, participation, and resource-management strategies (Rosalina et al., 2023). Regional evidence from Malaysia also links tourism, energy use, renewable energy, and environmental performance, but underscores the importance of the wider energy system (Raihan et al., 2023; Raihan, 2024). These studies suggest that tourism-related renewable adoption may occur at the level of firms, resorts, islands, or provinces without being large enough to move a national renewable-electricity share. This scale mismatch is directly relevant to the interpretation of the country-level panel results.

Research Gap and Hypotheses

The review identifies three connected gaps. First, a large share of the tourism-energy literature focuses on emissions, ecological footprint, total energy use, or renewable energy consumption, while renewable electricity share remains less examined. Second, many international studies combine cross-country and within-country variation, although fixed differences in hydropower resources, grid structure, and development can generate a strong pooled association. Third, few studies test the tourism-renewable electricity relationship with a two-way fixed-effects design tailored to Southeast and East Asian economies. The hypotheses distinguish the expected pooled pattern from the policy-relevant within-country relationship:

H1: In pooled country-year comparisons, international tourist arrivals are positively associated with the renewable share of electricity generation.

H2: After country and year fixed effects absorb time-invariant national heterogeneity and common shocks, the estimated association between tourist arrivals and renewable electricity share becomes materially weaker and statistically insignificant.

H3: GDP per capita is positively associated with renewable electricity share within countries after country and year fixed effects are applied.

METHODS

Research Design and Sample

The study uses a quantitative panel design based on secondary annual data for Cambodia, China, Lao PDR, Malaysia, Myanmar, the Philippines, and Singapore from 2000 to 2019. The sample is restricted to economies with complete observations for all core variables throughout the study period. Indonesia, Thailand, Viet Nam, Japan, and South Korea are not included because the assembled tourism or energy series contain gaps that prevent construction of a balanced panel. The final dataset contains 20 annual observations for each of seven economies (N = 140). Because sample selection is determined by complete data availability, the estimates apply to these seven economies and should not be interpreted as representative of all ASEAN and East Asian countries.

Data Sources and Variables

International tourist arrivals are obtained from UN Tourism statistics as compiled and standardised by Our World in Data (Ritchie & Roser, 2024). Renewable electricity share, GDP per capita, and population are taken from the Our World in Data energy and population series (Ritchie et al., 2024). The dependent variable is the percentage of total electricity generation produced from hydropower, solar, wind, geothermal, and other renewable sources. An electricity-generation measure is used because it is more directly connected to power-sector transition and offers complete coverage for the selected sample and period.

The principal explanatory variable is the natural logarithm of annual international tourist arrivals. GDP per capita is log-transformed to capture development level, and total population is log-transformed as a control for market size. Logarithmic transformation reduces scale differences and allows the coefficient on a logged explanatory variable to be interpreted as the percentage-point change in renewable electricity share associated with an approximate percentage change in that explanatory variable. Table 1 summarises the variables and expected signs.

Table 1. Variable Definitions and Measurement

Variable	Measurement	Expected sign
Renewable electricity share (dependent)	Percentage of total electricity generation from renewable sources (Ember, via Our World in Data).	n/a
Tourist arrivals	Natural log of annual international tourist arrivals (UN Tourism, via Our World in Data).	+/− (tested)
GDP per capita	Natural log of GDP per capita, current US$ (Our World in Data energy database).	+/−
Population	Natural log of total population.	+/−

Empirical Strategy

The analysis begins with descriptive statistics, pairwise correlations, and country means to document the pooled cross-country pattern. It then estimates two-way fixed-effects regressions that identify the association from deviations around each country's own time average while controlling for shocks common to all countries in a given year. The general specification is:

$$REShare_{it} = a + \beta_1 \ln(Arrivals_{it}) + \beta_2 \ln(GDPpc_{it}) + \beta_3 \ln(Population_{it}) + \mu_i + \lambda_t + \varepsilon_{it}$$

where $REShare_{it}$ is the renewable share of electricity generation in country i and year t; μ_i denotes country fixed effects; λ_t denotes year fixed effects; and ε_{it} is the idiosyncratic error. The baseline model includes tourist arrivals and GDP per capita. A second model adds population, a third adds the square of log tourist arrivals to test for non-linearity, and a fourth retains country fixed effects but omits year fixed effects as a robustness comparison. The tourism coefficient in the linear model is a semi-elasticity: a 1% increase in arrivals is associated with approximately $\beta_1/100$ percentage points of change in renewable electricity share. Standard errors are clustered by country to allow serial correlation and heteroskedasticity within each national time series (Petersen, 2009). This correction is conventional for panel data, but inference with only seven clusters can be imprecise; p-values are therefore interpreted cautiously rather than as definitive evidence (Cameron & Miller, 2015). An F-test for poolability evaluates whether country fixed effects are jointly required, and variance inflation factors are used to screen for severe multicollinearity. The design reduces bias from stable unobserved country characteristics but does not establish causality because time-varying omitted variables and reverse causality may remain (Baltagi, 2021).

RESULTS

Descriptive Statistics and the Pooled Pattern

The balanced panel contains 140 country-year observations. Tourist arrivals range from approximately 173,000 in Myanmar in the early 2000s to more than 65 million in China in 2019. Renewable electricity share ranges from 1.55% in Singapore to 100% in Lao PDR in several years, reflecting the contrast between limited domestic renewable generation and hydropower-dominated systems. GDP per capita spans low- and high-income economies, while population varies from small city-states to China. Table 2 reports the descriptive statistics.

Table 2. Descriptive Statistics (N = 140 country-years)

Variable	Mean	Std. Dev.	Min	Max
Renewable electricity share (%)	33.11	30.58	1.55	100.00
Tourist arrivals (log)	15.46	1.49	12.06	18.00
GDP per capita (log)	8.60	1.34	7.40	11.23
Population (log)	17.40	1.79	15.21	21.08
Fossil electricity share (%)	66.56	30.46	0.00	98.45

The pairwise correlations in Table 3 show that renewable electricity share is negatively correlated with tourist arrivals ($r = -0.562$) and GDP per capita ($r = -0.541$), and weakly negatively correlated with population ($r = -0.177$). Tourist arrivals are positively correlated with GDP per capita ($r = 0.635$) and population ($r = 0.519$). None of the pairwise correlations exceeds 0.80, and the reported variance inflation factors remain below 5; nevertheless, the correlation between tourism and income warrants caution when interpreting individual coefficients.

Table 3. Correlation Matrix of Core Variables

Variable	(1)	(2)	(3)	(4)
(1) Renewable elec. share	1.000	−0.562	−0.541	−0.177
(2) ln(Tourist arrivals)	−0.562	1.000	0.635	0.519
(3) ln(GDP per capita)	−0.541	0.635	1.000	−0.130
(4) ln(Population)	−0.177	0.519	−0.130	1.000

Country means in Table 4 reveal why the pooled relationship can be misleading. China and Malaysia combine large tourism markets with relatively low average renewable electricity shares, whereas Lao PDR and Myanmar have small tourism markets and much higher renewable shares because of hydropower. Singapore attracts substantial tourist volumes while having little domestic renewable generation. The negative pooled association therefore contradicts H1 and is consistent with a composition effect driven by fixed national characteristics.

Table 4. Country-Level Means, 2000–2019

Country	Mean arrivals (m)	Mean renewable elec. share (%)	Mean GDP/capita (US$)
Cambodia	2.9	23.1	2,515
China	51.0	19.6	9,661
Laos	1.8	90.4	4,198
Malaysia	21.1	9.4	18,419
Myanmar	1.6	56.4	3,938
Philippines	4.0	30.2	6,002
Singapore	9.5	2.6	55,833

Fixed-Effects Estimates and Hypothesis Tests

Table 5 presents four panel specifications. The coefficient on log tourist arrivals is statistically insignificant in every model and changes substantially across specifications. In the baseline two-way fixed-effects model, $\beta = 0.539$ (clustered SE = 7.183, $p = 0.940$), implying that a 1% increase in arrivals is associated with only 0.0054 percentage points of change in renewable electricity share. Adding population produces $\beta = 1.062$ ($p = 0.863$). The model with linear and squared tourism terms provides no evidence of a U-shaped relationship ($p = 0.611$ and $p = 0.647$, respectively), and the country-fixed-effects-only model also yields a non-significant tourism coefficient ($\beta = 2.981$, $p = 0.670$).

Table 5. Panel Fixed-Effects Regression Results (Dependent Variable: Renewable Electricity Share, %)

Variable	(1) Baseline	(2) + Population	(3) Non-linear	(4) Entity FE only
ln(Tourist arrivals)	0.539 (7.183)	1.062 (6.140)	34.803 (68.190)	2.981 (6.985)
ln(Tourist arrivals)^2	—	—	−1.281 (2.790)	—
ln(GDP per capita)	−12.341 (35.519)	−72.271 (45.950)	−75.701 (43.374)	5.442 (13.360)
ln(Population)	—	−201.52** (84.934)	−202.77** (86.752)	−11.554 (27.773)
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	No
Observations	140	140	140	140
Countries	7	7	7	7
Poolability F-test (p-value)	< 0.001	< 0.001	< 0.001	< 0.001

Note. Country-clustered standard errors are shown in parentheses. ** $p < 0.05$. The poolability F-test rejects the pooled model in every specification ($p < 0.001$), supporting the inclusion of country fixed effects. Because the panel contains seven country clusters, statistical significance should be interpreted cautiously.

The results support H2: once country and year fixed effects isolate within-country variation, tourist arrivals do not predict renewable electricity share. H1 is rejected because the pooled correlation is negative rather than positive. GDP per capita is statistically insignificant in all specifications and changes sign when year effects are removed; H3 is therefore not supported. Population is negative and statistically significant in Models 2 and 3, but this estimate should not be interpreted as causal. Its magnitude, sensitivity to specification, and the small number of clusters suggest that it may capture common trends and structural differences imperfectly represented by the available controls.

DISCUSSION

Interpretation and Relationship to Previous Research

The principal result is the divergence between the pooled cross-country pattern and the within-country fixed-effects pattern. A raw comparison suggests that economies receiving more tourists have lower renewable electricity shares, but that pattern is largely produced by which countries are in the sample. Lao PDR and Myanmar are hydropower-rich and receive relatively few visitors; Singapore and Malaysia receive many visitors but have limited or historically low domestic renewable generation. Once stable country differences and common year shocks are absorbed, annual tourism changes have no discernible relationship with annual changes in renewable electricity share.

This result does not imply that tourism and renewable energy are unrelated in every context. It instead qualifies studies that identify positive or non-linear linkages using broader panels, long-run estimators, renewable energy consumption, or environmental outcomes (Banga et al., 2022; Dogru et al., 2020; Zhang & Liu, 2019; Zhang et al., 2023). Those studies may capture long-run co-development, cross-country differences, or effects on emissions rather than a short-run within-country response of the national electricity mix. The present finding is closer to research showing that energy efficiency, renewable policy, resource endowment, and institutional conditions are more consistent determinants of environmental and power-sector outcomes than tourism volume alone (Deka et al., 2024; Pinjaman et al., 2025; Sakti et al., 2023).

The null result is also theoretically plausible. Under the Triple Bottom Line, economic expansion in visitor numbers does not automatically improve environmental performance; coordination, investment, and governance are required (Stoddard et al., 2012). Tourism businesses may install rooftop solar, purchase renewable electricity, or improve energy efficiency, but such destination- and firm-level actions can be too small to alter national generation shares. Conversely, large hydroelectric or grid investments can change the national renewable share without any preceding tourism shock. The level of analysis is therefore central: the national panel tests a system-wide electricity response, not the presence of green practices within particular destinations.

Policy Implications

The findings caution governments and destination marketers against treating tourism growth as a substitute for energy policy. More arrivals may expand revenues and create a market for low-carbon services, but renewable electricity deployment still requires bankable projects, credible regulation, grid access, system flexibility, and finance. Tourism policy can support the transition more directly by linking destination standards to verified renewable procurement, facilitating distributed generation for hotels and attractions, aggregating demand through power-purchase mechanisms, and coordinating tourism investment with utility and regional planning. These instruments create an explicit transmission mechanism from tourism activity to renewable demand.

The cross-country comparison also warns against using simple tourism-sustainability rankings as evidence of policy effectiveness. A high renewable share can reflect hydropower geography rather than tourism governance, while a low share can reflect land, grid, or resource constraints. Benchmarking should therefore distinguish inherited endowment from changes attributable to current policy. Within-country indicators—such as renewable procurement by tourism enterprises, destination-level energy intensity, installed distributed capacity, and avoided emissions—may be more useful for evaluating green-tourism initiatives than the national renewable share alone.

Limitations and Future Research

Five limitations bound the conclusions. First, the balanced panel contains only seven economies and excludes Indonesia, Thailand, Viet Nam, Japan, and South Korea because of missing observations in the assembled series. The results should not be generalised to the entire region. Second, the use of seven country clusters limits the reliability of conventional cluster-robust inference. Future replication should use a broader sample and small-cluster procedures such as wild cluster bootstrap inference. Third, fixed effects remove stable national heterogeneity but do not address all time-varying confounding, simultaneity, or reverse causality; causal designs would require credible instruments, policy discontinuities, or other sources of exogenous variation.

Fourth, international arrivals measure tourism scale but not tourism receipts, visitor nights, accommodation capacity, seasonality, domestic tourism, or the energy intensity of tourism services. Fifth, national renewable electricity share may conceal meaningful subnational change. Future research should combine destination- or province-level tourism data with renewable capacity, electricity procurement, grid emissions, and hotel-level energy performance. Extending the sample beyond 2019 would also permit analysis of the pandemic shock and subsequent recovery, although those years should be modelled explicitly rather than treated as ordinary observations.

CONCLUSION

This study tests whether international tourism growth is associated with renewable electricity transition in seven Southeast and East Asian economies between 2000 and 2019. The pooled data show a moderate negative correlation, but the pattern reflects structural contrasts among hydropower-rich, lower-tourism economies and tourism-intensive economies with low domestic renewable generation. In two-way fixed-effects models, the tourism coefficient is small, unstable, and statistically insignificant across linear, extended, non-linear, and robustness specifications. GDP per capita is also not a robust within-country predictor in the reported models.

The central conclusion is not that tourism can never support renewable energy, but that rising visitor numbers alone do not systematically change a national electricity mix. Renewable transition depends on an explicit institutional and investment pathway linking tourism demand and revenue to generation, grids, finance, and procurement. The study therefore contributes a substantive and methodological caution: cross-country tourism-energy correlations should not be interpreted as evidence of within-country change without an estimator and research design that separate the two.

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Author Contributions. H.M.R.: Conceptualisation, methodology, formal analysis, data curation, writing—original draft, and project administration. Y.F.: Conceptualisation, validation, and writing—review and editing.

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