

Assessing the Economic and Health Sustainability Corridor in the Asian Economy

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Abstract— This research explores the relationship between green growth, financial development, energy use, and environmental sustainability in Asian economies. It highlights the importance of addressing climate change issues to achieve the Sustainable Development Goals. The study uses panel data from 2010 to 2019 and complex econometric tools like PMG-ARDL and the Dumitrescu-Hurlin causality test. Results show that green growth, financial development, and renewable energy consumption all reduce air pollution in Asian countries in the short and long term. The study suggests that removing poor policies, ineffective resource management, corruption, and bureaucracy can help achieve the Sustainable Development Agenda Goals.

Keywords— *Financial Development, Green Growth, Air Pollution, Renewable Energy Consumption, Asian Economies*

I. INTRODUCTION

Since the industrial revolution, human activities have led to a significant increase in carbon emissions, primarily driven by economic growth. This heavy dependency on nonrenewable energy sources like natural gas, coal, and oil has led to severe weather events such as droughts, melting glaciers, floods, rising sea levels, and extreme temperatures. Energy is crucial for global economic and human growth, but the widespread use of nonrenewable fossil fuels has polluted many nations' environments. Climate change, a long-term change in the global climate system, threatens human and environmental health. A 1.5-degree Celsius global temperature rise in the next 20 years could cause catastrophic climatic occurrences. The 2015 Paris Agreement and EPA study recommend limiting global warming to 2°C by 2100 or 1.5°C by 2030 to avoid irreparable damage to the environment. The IPCC has confirmed that climate change threatens our ability to grow sustainably and survive.

Climate change and global warming have been linked to economic growth, energy use, and pollution. However, energy-growth research is extensive, and methods vary among nations, leading to inconsistent findings. The Environmental Kuznets Curve (EKC) model links economic growth and pollution, but some studies suggest it may not apply to all toxins or nations. Early studies focused on the relationship between overall energy consumption, climate change, and economic growth, neglecting renewable and non-renewable energy use's contributions to global warming and economic development. The economic boom began in the latter half of the century, leading to increased carbon emissions. To protect the environment without hindering economic progress, economists worldwide are creating economic models that focus less on the minimum carbon needed for growth. Sustainable renewable energy sources like wind, biomass, solar activity, and geothermal energy are crucial for maintaining a high standard of living. Climate change threatens human and environmental health, and limiting

global warming to 1.5 degrees Celsius is "now or never" as harmful carbon emissions reached record highs between 2010 and 2019.

Corporate reliance on renewable energy stabilizes the fossil fuel market and has been linked to financial and economic growth. Advances in finance have led to the creation of valuable financial resources and the categorization of financial data, which can be facilitated by prudent financial management. Globalization in the financial industry has simplified risk distribution, raising funding and lowering equity costs. Wealth increases economic growth, which affects energy use and environmental laws. Economic freedom is affected by information access and idea exchange [1].

Green growth is economic growth that prioritizes environmental sustainability without compromising access to renewable resources or quality of life. China is leading the "green" movement, with renewable energy being the only clean energy sources. However, the government's renewable energy strategy is a concern due to growing evidence linking green energy to economic prosperity.

Asian economies would benefit from research on how air pollution affects financial development, green growth affects air pollution, and renewable energy consumption. The relationship between economic growth, environmentally friendly growth, renewable energy sources, and air pollution has gained attention due to climate change and global warming. The Environmental Kuznets Curve (EKC) describes this relationship, showing that pollution levels rise with economic expansion until a threshold is reached, after which growth slows [2]. The study explores the impact of renewable and nonrenewable energy sources on economic growth and climate change. It focuses on selected Asian economies, including Japan, the Korean Democratic People's Republic, Saudi Arabia, Singapore, Bangladesh, China, Indonesia, Iraq, Iran, India, Lebanon, Malaysia, Myanmar, Pakistan, Qatar, the Philippines, Thailand, the UAE, Jordan, Vietnam, Turkiye, Bahrain, Brunei Darussalam, Cambodia, Mongolia, Sri Lanka, Tajikistan, Yemen, Syria, Uzbekistan, and Laos, as these regions are believed to have the greatest impact on climate change.

II. LITERATURE REVIEW

Over the past twenty years, many studies have found that fossil fuel use increases carbon dioxide emissions in both developed and developing nations. Thus, more governments and politicians are realizing that renewable energy can meet the public's energy needs while lowering carbon dioxide emissions. Renewable energy and CO₂ emissions have received more attention in recent study. Renewable energy consumption was inversely proportional to US carbon dioxide emissions between 1960 and 2007. One example [3] illustrates

this. China and India studies from 1972 to 2011 indicated a two-way relationship between CO₂ emissions and renewable energy. The sole indication of unidirectional causation was in China.

Since wind patterns change seasonally, air pollution can spread quickly between provinces. One must research the geographical locations of the many elements that contribute to air pollution when studying the factors themselves. We are unaware of any geographical context in research on renewable energy and local air pollution in China.

This may demonstrate that productive firms may be funded, and it can be used that way. According to this notion, economic expansion reduces environmental damage. Increasing the money supply may boost research and development, foreign direct investment, and economic activity, which improves environmental quality through greener spending. Healthy financial sectors enhance energy efficiency, reduce energy emissions, and lower borrowing rates. However, [4] a growing economy and industrial sector may increase pollution and other environmental harm. Academic studies and data dispute on how expanding banking might effect carbon dioxide emissions and economic growth. Most earlier research have failed to establish a causal link between economic growth, financial success, and CO₂ emissions. Numerous research, such as [5] for nine Central and Eastern European nations and [6] for Sub-Saharan African governments, have established a unidirectional causal relationship between expanding markets and stable finances.

Growing numbers of studies have included "green growth" as a key component in establishing the relationship between economic expansion and emissions. Eco-friendly development, economic growth, and carbon dioxide emissions were examined in recent research by [7]. Rising energy demand, especially from nonrenewable sources, has been linked to environmental damage in recent years. In answer to a public question, [8] and [9] recorded this evidence. Due to this, several researchers are striving to identify a treatment for this type of ED.

[10] say air pollution in industrialized and emerging nations is caused by fossil fuel use. They measured REN, fossil fuel use, and air pollution in China's GDP between 2011 and 2017 regionally. Researchers observed that renewable energy and green innovation were rising internationally but becoming less linked to fossil fuels in their particular regions. This was despite a global movement toward green technology and renewable energy. Many blame China's main cities' air quality decline on the increased usage of fossil fuels in the energy sector. Environmental levies were important to the study's authors, but they should have included them. This research addresses that need by examining how environmental taxes might be combined with other initiatives to minimize environmental degradation, such as reducing fossil fuel use and expanding renewable energy and ecological technologies. The collaboration aims to stop environmental degradation.

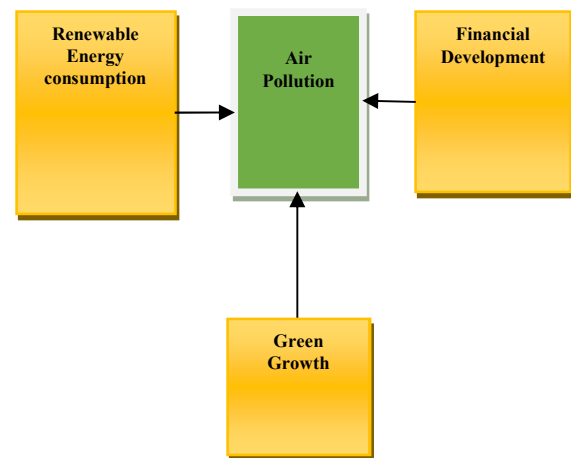
[11] examined how NREN affects the cultural and economic growth of numerous African oil-producing states. This study found that NEN consumption affects EG and CE emissions differently in different economies. Scientists studying environmental degradation have given innovation less attention [12]. Current research will consider ecological developments while assessing the ecosystem's health. [13] examined the relationships between REN, NEN, and CE in a

global sample using heterogeneous panel estimates. For this study, researchers analyzed data from 74 nations between 1995 and 2015. REN has a detrimental impact on the environment, while NEN has a beneficial impact on the ED.

After seeing that NEN greatly affected ED, researchers concluded this. The investigation gathered data from many countries, each with its own environmental difficulties that may or may not affect the outcomes. Asia has the most polluted regions and serious environmental challenges, however this study has focused on Asian economics..

III. METHODOLOGY

A. Conceptual framework



B. Specification of the Model

The term "model specification" refers to the method of choosing the variables that will be implemented in a particular model [14]. It could be beneficial to include all relevant variables in the model definition; however, doing so might cause the statistical power of the model to decrease. Consequently, to investigate the relationships between air pollution, green growth, consumption of renewable energy sources, and financial development in Asian nations, we have developed the econometric model formulation that will be discussed further below.

$$API = F[FDI, REC, GGI] \dots (1)$$

API is an indicator of air pollution and is therefore specified as a dependent variable in the preceding equation. When discussing the index of financial development, however, we use the term FDI to refer to the independent factors. The Renewable Utility Renewable Energy Consumption Index (REC) and the Green Growth Index (GGI) are two measures of environmental performance. In effort to remove the prospect of heteroscedasticity, the natural log is applied to every one of these variables' sets of data. The empirical formula might be expressed as follows:

$$API = \beta_0 + \beta_1 FDI_{iq} + \beta_2 REC_{iq} + \beta_3 GGI_{iq} + \mu \quad (2)$$

Where β_0 and β_1 -3 are the intercept and coefficients of the variables respectively, and (i) indicates the country and q represent time period.

C. Data Sources

Between 2010 and 2019, the article examines the impact of green growth, financial development, and the use of renewable energy on air pollution in 31 Asian economies. The World Bank Development Indicators database and the air pollution and green growth indices of the Organization for Economic Cooperation and Development (OECD) were the sources of the data. The analysis aims to provide understanding of the factors that lead to these disparities as well as workable solutions. Understanding the status of global climate change requires an understanding of the findings.

D. Economics Approach

1) Panel Unit Roots

Before choosing an econometric model for empirical research, the panel unit root test is an essential tool for assessing the integration and cross-sectional interdependence of variables. This stage was completed in this study, which also used the augmented Dickey-Fuller test that is cross-sectional [15]. The CIPS and CADF tests both mainly rely on the presumption of cross-sectional dependency, and both tests came back affirmative. The experiment evaluated the alternative hypothesis, which postulates the existence of a unit root. The results showed that each variable is non-stationary at the first level, but at the first level, when stationary, it becomes non-stationary if necessary. This supports the hypothesis that variables are considerably cointegrated over time. First-generation panel unit root tests should not be relied upon due to cross-sectional dependencies in the sample data. The second-generation unit root test was applied to the data in this study. The equation in its most basic form, $\varepsilon_{\sigma q}$ with functioning as the independent variable, is written as follows:

$$\varepsilon_{\sigma q} = (1 - \varepsilon_{\sigma})\tau_{\sigma} + \tau_{\sigma}\varepsilon_{\sigma, z-1} + N = 1, \dots, O; N = 1, \dots, Q \quad \dots \dots \dots (3)$$

Where $\varepsilon_{\sigma q}$ means the error term, which may be expressed as the function of the common factor's hidden function.

$$\varepsilon_{\sigma q} = N_{\sigma}K_q + \mu_{\sigma q} \quad \dots (4)$$

As $\varepsilon_{\sigma q}$ represents a variable that differs depending on the nation, and as a result, we get the following equation 5 from the previous one (Equation 3).

$$\nabla \varepsilon_{\sigma q} = \beta_{\sigma} + \partial_{\sigma}\varepsilon_{\sigma, z-1} + N_{\sigma}K_q + \mu_{\sigma q} \quad \dots \dots (5)$$

Therefore, we use a method called the CADF panel unit root test to check for trends in the data.

$$\nabla \varepsilon_{\sigma q} = \beta_{\sigma} + \partial_{\sigma}\varepsilon_{\sigma, z-1} + d_{\sigma}\nabla \alpha_q + \mu_{\sigma q} \quad (6)$$

The integration order is determined using the OLS estimator ∂_{σ} , which is predicated on the null hypothesis that there is no stationary association with each series in equation (6). The econometric expression for CADF t in statistics is given by the following equation (7).

$$k_k(T, K) = \frac{\nabla \exists \dot{y}_{\theta} \bar{M}_{m k \theta-1}}{\pi_{\sigma}(\dot{y}_{\theta} \bar{M}_{m k \theta-1})} \quad \dots (7)$$

The following CIPS tests need critical values and simulations, all of which are derived from the aforementioned basic equation (7).

$$CIPS(T, K) = \bar{k} = T^{-1} \sum_{s=1}^K k_{\sigma}(T, K) \quad \dots \dots (8)$$

2) Westerlund Cointegration Test

Granger's causality analysis highlights how crucial it is to ascertain whether variables are stationary in order to evaluate the likelihood of variable cointegration. By implying that panels are unconnected, the "null hypothesis" precludes cointegration. A standard component is not necessary for the Westerlund panel cointegration test, which assumes the existence of error correction for both individual panel members and the panel overall [16]. This method aids in assessing how well the variables in a study cointegrate. This is because it is predicated on the idea that a standard component's existence or absence is just one of numerous confounding factors that could change the test results. This is due to its foundational premise that the existence or non-existence of a standard component is merely one of many. In order to ascertain if a standard component is present or not, the test was designed to regard its existence or absence as only one of many possible outcomes. This is the cause of the current circumstance as a result. To put it another way, the test was created with the potential for a non-standard component (Pt and Pa) in consideration. The technique stands out because to its concentration on structure rather than residual dynamics, which makes it immune to the impact of confounding variables. The following equation represents the econometric model utilized for the cointegration test that [16] carried out in its mathematical form.

3) Panel ARDL Approach

The maximum likelihood estimate (MLE) was applied, and the groups that were determined to exist were referred to as "Mean's Group (MG)," "Pooled Mean Group (PMG)," and "Dynamic Fixed Effect (DFE)" by [17]. In the next part, we will talk about the PMG model, an error correction model that falls into that category due to its use of panel regression.

$$API_{ik} = \rho_t + \sum_{f=1}^{q1} \lambda_{ij} FDI_{ik-t} + \sum_{f=1}^{q2} \mu_{ij} REC_{ik-t} + \sum_{f=1}^{u3} \theta_{ij} Q_{ik-t} + \epsilon_{ik}$$

Where Z is a positive integer representing the total number of nations taken into account, to express the passage of one year, we write $f=1, 2, 3, 4, \dots, t$. The delay times are denoted by the symbol [f]. Lag variables are denoted by [t] for the dependent variable and 1 for the independent ones. There are many indices being examined in this study, including the Air Pollution Index (API), Green Growth Index (GGI), Renewable Energy Consumption Index (REC), Financial Development Index (FDI), and I, an error term with a "fixed influence" on the other indices. As a means of rearranging equation (2), Pesaran, Shin, and Smith rewrote it as follows [17].

$$API_{ik} = \rho_t + \delta API_{ik-1} + \phi_{\alpha} B_{ik-1} + \sum_{f=1}^{q-1} \varrho_{f1} API_{ik-2} + \sum_{s=1}^{j-2} \varpi_{jq}^t B_{ik-2} + \epsilon_{ik}$$

$$\text{Where } \gamma = -2[2 - \sum_{f=1}^q \omega_{jq}], \delta_{jq} = \sum_{s=1}^j \delta_{jq}, \omega_{jq} = - \sum_{z=m+1}^q \omega_{mn}, \quad \psi \text{ numbers from 2 to } F-1, \text{ and } \delta_{jq}$$

$$= - \sum_{z=m+1}^t \omega_{mn}, \quad \psi = \text{numbers from 2 to } J-1.$$

Equation 5 is modified using the error correction algorithm and parameters that categorize the levels.

$$API_{ik} = \vartheta_j \{API_{ik-1} - \phi_1 B_{ik-1}\} + \sum_{f=1}^{q-1} \varrho_{f1} API_{ik-2} + \sum_{s=2}^{j-2} \omega_{ljq} B_{ik-2} + \epsilon_{ik}$$

The estimates are calculated and given in the following way as a direct result of this, which is as follows:

$$\gamma_{CJP} = \frac{\sum_{j=1}^U \epsilon_k}{U}, \eta_{Wcjp} = \frac{\sum_{j=1}^U o_k}{U}, \omega_{wcjp} = \frac{\sum_{j=1}^U \pi_k}{U}, \text{ and} \\ = \lambda_{wcjp} = \frac{\sum_{j=1}^U \lambda_i}{U}$$

Where, $w=0$, -----, $q-1$, $\gamma_{CJP} = \phi$

$$API_{ik} = \phi_1 + \eta_i [API_{i,k-1} - \gamma_1 FDI_{j,k-1} - \gamma_2 REC_{j,k-1} - \gamma_3 GGI_{j,k-1}] \\ + \sum_{f=1}^{q-1} \tau_j^i \phi |API_{ik}|k-1 + \sum_{f=0}^{q-1} \theta_1^i \epsilon \phi |FDI_{ik}|k-1 \\ + \sum_{f=0}^{q-1} \delta_{2\epsilon}^i \phi |REC_{ik}|k-1 \\ + \sum_{f=0}^{q-1} \theta_1^i \epsilon \phi |GGI_{ik}|k-1$$

The PMG estimator considers short-term fluctuations but bases its results on the assumption of long-term stability. In the context of the panel ARDL method, the following estimate (the "MG estimator") is provided. Use this calculator to narrow your search by country. In contrast, the PMG approach requires consistent and sporadic participation from a wide range of people. The series length was used to assess the "estimator's" consistency and dependability. As the last component of an estimating procedure known as the "ARDL approach," the "DFE estimator" is a valuable tool. The DFE method employs homogeneity restrictions in the immediate and far future.

4) Panel Causality Tests

Although the panel ARDL coefficients can give valuable insights, they do not indicate the causal link between the indicators that are the subject of the investigation. Additional knowledge of the causal relationship is required if policymakers are going to be able to develop successful policies. In order to determine whether or not there was a link between the series, [18] came up with the "Granger Casualty test." The purpose of this examination was to conclude whether or not there was a connection between the series. In circumstances in which "T > N or T N," the test can discern between "heterogeneous and imbalanced panels" [18]. The Monte Carlo simulation illustrates how reliable the statistics are in models that only use tiny datasets. The "heterogeneous linear model" was the primary focus of our attention throughout this particular investigation.

$$\rho_{i,k} = b_i + \sum_{k=1}^{\mu} \delta_{\mu}^i Z_{i,k=n} + \sum_{k=1}^{\mu} \sigma_{\mu}^i Y_{i,k=n} + \epsilon_{i,k}$$

In the equation shown above, Z and Y are observable variables for k time and nations. It is expected that both $\sigma_i = (\sigma_{i,1}, \dots, \sigma_{i,N})$ and b_i remain the same throughout. In the context of this method of testing for non-causation, the "null hypothesis" states that there is no connecting link between any of the panels. In comparison, the alternative hypothesis operates on the presumption that there is at least one cause associated with the panels. This hypothesis is expressed in the following form:

$$H_o = \sigma_i = 0 \text{ for } \varrho_i = 1, \dots, \mu$$

$$H_o \left[\begin{array}{c} \sigma_i = b_i = 1, 2, \dots, \mu \\ \sigma_{i \neq b_i} = \mu_1 + 1, \mu_2 + 2, \dots, \text{to } \mu \end{array} \right]$$

IV. FINDINGS AND DISCUSSION

A. Unit Roots Results

The correlation matrices of the economies of Asia are examined in this study, and the results demonstrate that although they are similar in terms of growth and sophistication, they differ significantly. Cross-sectional Pesaran and Shin (CIPS) and augmented Dickey-Fuller (CADF) unit-root tests are used in the study to ensure that each variable maintains its previous value. The CADF and CIPS unit-root tests are useful for managing cross-sectional dependence when applied to panel data using a heterogeneity model with autoregressive coefficients. It has been empirically shown that the CIPS and CADF unit-root tests work well with panel data, despite their detractors. When the first difference is applied to the estimated model with constant and trend, the variables stabilize at I (1) with a 5% significant difference. While all CIPS and CADF unit-root test variables are not fixed at levels [I (0)], the analysis demonstrates that GGI and FDI approximation variables are stable at levels [I (0)] for CIPS unit root tests.

TABLE I. UNIT ROOT TEST RESULTS

Variables	Level		First Difference	
	CIPS	CADF	CIPS	CADF
GGI	-5.12*	-1.190 [0.0]*	-2.569*	-2.569 [0.00]*
REC	-1.870	-1.731 [0.225]	-2.512*	-2.181 [0.02]*
FDI	-3.24*	-4.87 [0.03]*	-2.243*	-2.243 [0.01]*
API	-1.374	-8.752 [0.61]	-3.863*	-1.922 [0.00]*
Please Note: *, ** and *** signify 1%, 5% and 10% levels of significance.				

B. Cointegration Tests

The cointegration technique may be used when the stationary properties of the Pesaran CIPS and CADF unit-root tests have been demonstrated. GGI and FDI become level when the Pesaran CIPS unit root test results are taken into account. By doing this, the use of OLS as a method to ascertain if the two variables are cointegrated is eliminated. To achieve this, [16] created a technique called cointegration.

Table 2 displays the outcomes of this cointegration test. One trustworthy method for identifying and fixing issues is the cointegration test, which was created by [16]. To determine the ideal lag time between the variables (AIC), they employed statistical estimators of fit quality, including the Akaike Information Criterion and the Schwarz Bayesian Information Criterion (SIC). The AIC criteria are used to select the model when the intercept is constant but there is no discernible trend.

Table 2 presents a comparison between the Z-value estimations made by [16] and the significant values discovered both within each group (Gt and Ga model) and generally speaking (Pt and Pa model). Ga (-2.118, $P < 1.00$) and Pa (1.-980, $p < 0.976$) some factors, including cross-section dependency, serial correlation, and heterogeneity, point to the possibility of cointegration being present. This illustrates that the calculated variables are connected in dynamic cointegration equilibrium over the short and the extended period. And at a conclusion, we find that $Pa/T = (1.-980)/11 = -0.18$ is the value of the coefficient of the lagged error correction term (ECM) in our model. Equilibrium long-run cointegration with the calculated variables in Asian economies is thus represented in Table 2 and suggests that any short-run disequilibrium will be addressed at 18% annually.

TABLE II. COINTEGRATION RESULTS

Statistic	Value	Z-Value	P-Value
Gt	-4.332	-14.259	0.000
Ga	-2.118	5.074	1.000
Pt	-9.779	-1.867	0.031
Pa	-2.024	1.-980	0.976
Notes: ** refer significant at 1%.			

C. ARDL Panel Method Results

The study explores the correlation between air pollution, green growth, renewable energy utilization, and financial development. It finds that green growth negatively impacts air pollution in both short and long terms, with a 1% increase in green growth reducing pollution by 0.956% in the short run and 0.136% in the long run. Additionally, long-term use of renewable energy leads to a negative impact on environmental air pollution, with each 1% increase resulting in a 1.07% decrease.

According to the report, moving away from fossil fuels and toward renewable energy sources is critical for long-term success in mitigating air pollution. According to PMG predictions, using renewable energy will raise air pollution by 2.011% for the same 1% short-term volatility. Large-scale expansions of forest and bioenergy plantations may result in deforestation, land use changes, and increased air pollution. As a result, the use of these resources should be closely managed in order to reduce the negative outcomes. The study also demonstrates a transient relationship between financial development and air pollution levels, with a drop of 1.200% in the near term and 9.11% in the long run for each 1% change in financial development. The results confirm by [19]; [20].

TABLE III. MODEL RESULTS

Variable	MG		PMG		DFE	
	Long term	Sort Run	Long term	Sort term	Long term	Sort term
ECT	-1.183 [0.00]*		-0.680 [0.00]		-0.767 [0.00]*	
FDI	-3.279 [0.72]		-9.11 [0.03]*		-0.305 [0.00]*	
REC	-11.37 [0.02]*		-1.07 [0.00]*		-0.148 [0.07]*	
GGI	18.78 [0.01]*		-0.136 [0.00]*		-0.359 [0.02]*	
FDI		-10.61 [0.07]		-1.020 [0.00]		-0.234 [0.00]*
REC		-9.536 [0.08]*		-2.011 [0.04]*		-0.015 [0.89]
GGI		-5.322 [0.03]*		-0.956 [0.05]*		-0.219 [0.01]*
Constant	11.107 [0.00]*		-3.413 [0.008]*		-1.321 [0.006]*	
Hausman	0.412 [0.824]				2.671 [0.007]*	
Observations	279		279		279	
Notes: ECT: Error Correction Term. *, 5% is the threshold for statistical significance. The coefficient's value is not in parentheses.						

D. Causality Analysis

By investigating the connection between environmental factors and air pollution, the study by [19] sought to enhance environmental conditions in Asian nations. Green growth, the use of renewable energy, and financial development all contribute to mutually reinforcing air pollution, according to Granger causality panel methodologies, which provide accurate estimates.

TABLE IV. CAUSALITY RESULTS

Dumitrescu & Hurlin panel causality results				
Hypothesis	W-stat	Z-bar	Z-bar tilde	Conclusion
AP-FDI	5.648	18.30 [0.00]*	6.88 [0.00]*	Bidirectional
FDI- AP	2.517	5.975 [0.00]*	1.68 [0.09]*	
AP- GGI	6.722	22.52 [0.00]*	8.66 [0.00]*	Bidirectional
GGI- AP	4.213	12.65 [0.00]*	4.50 [0.00]*	
AP- REC	2.762	3.502 [0.00]*	6.61 [0.00]*	Unidirectional
REC- AP	3.415	10.05 [0.90]	4.30 [0.60]	
Please Note: ** refer significant at 1%.				

V. CONCLUSION AND RECOMMENDATION

The study looked at how air pollution levels in Asian nations were affected by green growth, the use of renewable energy, and financial development. With a 1% increase in green growth leading to a 0.956% short-term and a 0.136% long-term drop in air pollution, it was discovered that green growth had a detrimental impact on air pollution both in the short and long term. Additionally, using more renewable energy has a negative effect; for example, a 1% increase in renewable energy use results in a 1.07% decrease in air pollution.

According to the study, financial development, green growth, and the use of renewable energy sources have all made a substantial contribution to the decline in air pollution

in Asian nations. Asian economies must cooperate in order to address climate change issues and hasten the energy sector's shift to renewable energy sources. In order to boost institutional effectiveness and promote technological innovation in clean energy, governments ought to create distinctive human resource strategies. Given the high cost of investing in renewable energy sources, emerging Asian countries should look for alternate financial sources to assist their energy development programs, particularly for poorer nations.

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