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Energy use, emission rate and economic growth linkages among Asian superpowers

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Abstract

The paper explores the relationship between energy use, economic growth and emission rates for Asian giants such as China, India and Japan. As these countries are the regional economic powers and also the major global carbon emitters, it is inevitable to conduct a research study to find the possible relationship between energy use, emission and growth among these countries by the panel data analysis over the period from 1991 to 2020. Higher energy usage increases greenhouse gas (GHG) emissions in countries, with agricultural sectors, Foreign Direct Investment (FDI) and urban populations contributing significantly. Energy use influences economic growth and emission levels, positively affecting GHG emissions. Furthermore, current initiatives taken by these three Asian superpowers for net zero carbon emission and relevant suggestions are also highlighted for emission reduction without compromising the economic growth and sustainable use of energy resources.

Keywords

Asia; economic growth; energy use; GHG emission; GMM estimation; India

Introduction

Since the 1990s, researchers have analysed the primary relationship between the country's economic growth (GDP) and their emissions, the influence of energy consumption in the various sectors, their economic developments and vice-versa. Therefore, the linkage between energy use, emission rate and economic growth is inseparable for the world economies. However, with an increase in the emission rate, it seems vital to analyze how the intensities of different elements vary concerning changes in GDP. Also, energy use across the sectors influences emissions significantly but is expected to contribute more to economic growth as it promotes employment in the country. Developing countries with diverse land use, populations and economies have significant potential for emission reduction but require substantial financial and technical support to utilize their physical capital effectively (1). The interconnection among the three aspects of economic growth, energy consumption and greenhouse gas emissions has rapidly risen, perhaps the most critical factor concerning sustainable development. Not surprisingly, with current urgent questions about climate change, three of the largest economies in Asia - China, Japan and India stand at the cutting edge of this issue. These countries at different economic development levels belong to different energy demands and emit different emissions. Therefore, they hold vital positions in setting the global environmental agenda. Understanding the impact of economic growth on energy consumption and resultant emissions is crucial to designing policies that balance development and sustainability.

These countries are significant contributors to global emissions, and every action they take is crucial in the fight against climate change. Indeed, the world is looking up to these Asian superpowers for a good example through the reduction of emissions while growing their economies. In trying to meet the goals of the Paris Agreement (2015), it will be essential to understand how economic growth, energy use, and emissions are connected in these three countries to develop effective future climate policies (1). The existing literature supports only the essential relation among the three macroeconomic variables, *i.e.* GHG emissions are positively and negatively influenced by GDP per capita under the market-based and bank-based economic systems, respectively (2). The positive impact of energy consumption on carbon emission also indicates that there can be a reduction in the emission without any compromise in the economic growth of the countries in the MENA (Middle East and North Africa) region (3). All these environmental challenges have complicated and perplexing elements and solving ecological problems requires international/ regional cooperation (4). Energy adaption is the changeover towards renewable energy sources and decarbonizing economic activity (5). The study of emissions, energy and growth rate is crucial in the ongoing struggle to conserve the environment and sustain development. The influence of energy consumption on economic growth is significant as its increased use will increase economic growth. The huge GHG emitters of the world are China, the USA, India, Russia and Japan, apart from the European Union with 26, 13.9, 6.7, 4.7 and 2.9 per cent, respectively, during 2021-22 (6-7). China is the top global GHG emitter, followed by India and Japan among the Asian countries (6). The trend in the emission rate concerning the major emitting countries in the world over the years (2010-2020) is presented in Fig. 1. Apart from the known sources like industrial energy use and agricultural practices and their emissions, livestock and manures, crop burning and transportation as the sub-sectors contribute for the accountable amount of share in the total GHG emissions (8). The existing literature indicates that increased FDI inflows are essential for economic growth, but they can also increase carbon emissions rates, consequent on environmental damage. The linkage between these variables is complex to model as they interact simultaneously. Thus, the FDI and GDP are the two crucial variables used to proxy for the economic growth rate in the model for analysis. Therefore, China, India and Japan, the significant emitters among Asian countries, were considered for the study using panel data with variables such as agricultural and industrial growth. Even after the International climate agreements, the trend in emissions has taken a hike. Thus, there is a need to study the factors determining the emission rates among the Asian powers. With this background, the present study is undertaken with the following objectives: to identify the determinants impacting the emission of the countries; to examine the linkages of energy use and the economic growth on GHG emissions; and to suggest the mitigation measures to improvise the environmental status of the countries.

To study the linkages between the economic growth, energy and emission rates among the Asian superpowers, it is necessary to review the emission-related protocols and their historical analyses. An econometric study concluded that increased fossil fuel consumption concerning economic development and rapid urbanization will lead to global carbon emissions (9). Energy inputs also impact production and economic advancement (10-11). So, the economic growth with excessive energy use has resulted in higher rates of greenhouse gas (GHGs) emissions. Carbon emissions, the primary source of the greenhouse effect, appear to exacerbate global warming and climate change worldwide (12). Energy use of all the sectors for the various upstream and downstream activities from production to consumption of the products are considered in the computation of emission rates about energy use and growth linkages.

The Intergovernmental Panel on Climate Change (IPCC)'s "Principles Governing IPCC Work" outline its procedures for analyzing human-caused climate change, its potential consequences and preventative measures. These guidelines ensure impartial, open and transparent evaluations, policy-neutral reporting and objective policy implementation. The United Nations Framework Convention on Climate Change (UNFCCC) introduced a series of annual meetings, known as the Conferences of Parties (COP), in 1995 to look after the emission reductions and set the targets for the parties. Various important intergovernmental and binding agreements have been discussed, starting from the IPCC, Kyoto Protocol, Copenhagen Summit and the most recent Paris Agreement. The major emission-related protocols are mentioned, as shown in Fig. S1. Based on past research papers, the review has been conducted to identify/ select variables, economic growth and emission rates worldwide. Income growth does not have a significant and substantial impact on the long-term Carbon emissions in the US, thus possibly suggesting that economic growth cannot be relied upon to solve environmental problems (16).

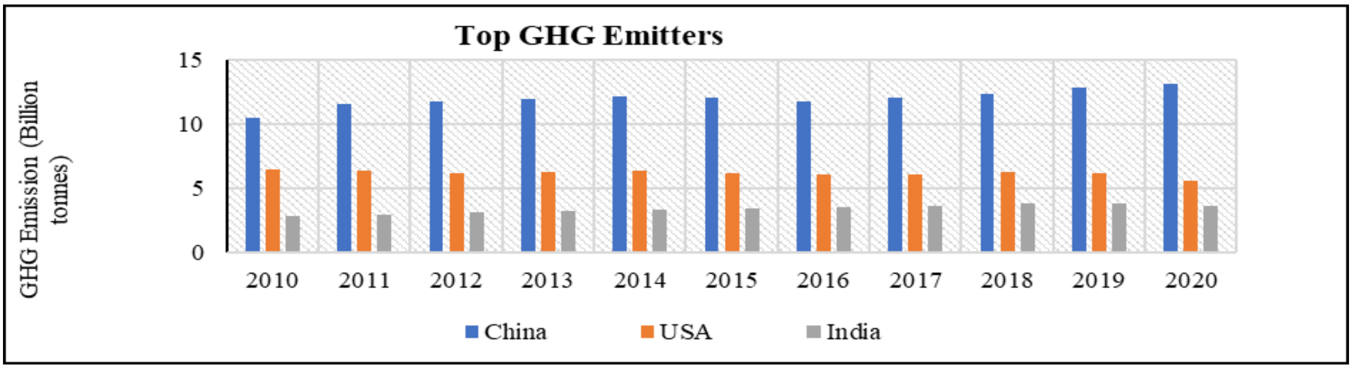

Fig. 1. Trend of the emission rate of major emitting countries in the world (2010-2020). Source: Climate Watch, WRI (2021).

The inverted-U relation between emission and per capita GDP. It thus proves that environmental legislation can even flatten the Environmental Kuznets Curve (EKC) and even move the turning point of the curve (17). Countries with smaller long-run income elasticity faced reduced carbon emissions with a rise in their income (18). A study outlined in detail the significant impact of carbon emissions on energy consumption in the country (19). Their findings stressed the need to reduce levels of carbon emissions. The study of 43 developing countries suggested that an increase in income cleans carbon dioxide emissions with long-term elasticities of income, which are smaller in the Middle East and South Asia (20). The hypothesis of the EKC suggests that economic growth and reduction of environmental degradation complement each other and are inversely U-shaped (21). This study stipulates the necessity of the incorporation of ecological productivity. A study on the hypothesis of the EKC as relating SO_n emissions to per capita GDP in 74 nations found it "problematic" (22).

Energy consumption was found to positively impact environmental pollution, with a unidirectional relationship between consumption and emission. A study showed the strong connection between energy consumption and CO_2 emissions for twelve countries in MENA, where per capita GDP plays a significant role (23). A positive correlation was discovered between carbon emissions, energy consumption and per capita GDP in 25 countries (24). Based on the panel vector error correction model, a considerable positive long-term association exists between ASEAN (Association of Southeast Asian Nations) countries' power usage and carbon emissions (25). A study found that energy consumption significantly influenced carbon dioxide emissions, with actual output following an inverted U-shape pattern in 11 Commonwealth Independent States countries (26). Growing per capita energy consumption caused environmental degradation in industrialized and developing nations, resulting in long-term damage to CO_2 emissions (27). Analysis of Shanghai's link between carbon emissions, energy consumption and economic development found a positive long-term equilibrium among these components (28). Turkey's CO_2 emissions, energy consumption, GDP and international trade (1960 to 2005) and a long-term link were discovered, and these variables influencing CO_2 emissions were found (29). In Malaysia, the study revealed a direct relationship between economic growth, carbon emissions and energy consumption (30). Energy consumption and carbon emissions in Mauritius and concluded non-stationary, co-integrated factors that substantially influenced economic growth were identified (31). Trade openness is a crucial issue that can significantly affect environmental quality. A study revealed that an 18 per cent increase in China's urban population contributed 40 per cent to carbon emissions (32).

An inverted-U relationship between urbanization and carbon emissions among developing nations, suggesting consideration in climate change policies, was obtained (33). Research on urbanisation's impact on carbon emissions and energy use in 99 countries found that urbanisation positively affects middle-income groups, providing valuable insights for policymakers and urban planners (34). Research indicates that trade can benefit the ecosystem, while others believe it is damaging (35-36). A study found that long-term income and energy usage are the primary drivers of carbon emissions, with trade having a minor, statistically insignificant impact (37). The effect of trade liberalisation on scale, method and composition and contradicting empirical findings on the significance of trade openness were examined (38). Trade has a negative influence on carbon dioxide emissions (39). Trade openness positively impacts Pakistan's carbon emissions while reducing emissions (40-41). The study also found a negative correlation between carbon emissions and urbanization in developing nations (42). Some existing literature related to the study of the variables, such as emission rate, economic growth and energy use nexus, were reviewed and tabulated in as shown in supplementary Table S1.

Materials and Methods

Data and Description

The data on GHG emissions of the countries were collected for 30 years (1991–2020) for the analysis. The annual secondary data were collected from various sources like our World in data, World Development Indicators (WDI), Food and Agriculture Organization Corporate Statistical Database (FAOSTAT), Statistical Year Book, International Energy Agency, UNCOMTRADE, World Bank (World Integrated Trade Solutions (WITS)) and the World Bank database for the three countries (43-46). As the historical studies suggested, the data for GHG emission with agricultural irrigated land, livestock emission, urban population and energy use, GDP and Foreign Direct Investment (49) were collected from various data sources, as shown in Table 1 (47-49). The variables are checked for the cross-sectional dependency test, unit root test and descriptive statistics, as shown in supplementary Table S2 and S3.

Methodology

The study was carried out for the panel data across the variables selected and over thirty years (1991–2020) for the major emitting countries (China, India and Japan) in Asia with the framework as shown in Fig. 2. Besides total GHG emission by the Asian countries, top three countries *viz.* panel countries were selected based on their nature of energy use (Fig. 3). Similarly, the energy consumption trend of the Asian Super Powers compared with the world and Asia, as shown in in Fig. 4. In single equation models, our emphasis is on estimating the average value of Y conditional upon the fixed values of the X variables. But in many situations, Y is determined by the X's and some of the X's are, in turn, determined by Y. In short, a two-way or simultaneous relationship exists between Y and (some of) the X's.

$$Y_{1i} = \beta_{10} + \beta_{12}Y_{2i} + \gamma_{11}X_{1i} + u_{1i}) \qquad \text{(Eqn. 1) (50)}$$

$$Y_{2i} = \beta_{20} + \beta_{21}Y_{1i} + \gamma_{21}X_{1i} + u_{2i}) \qquad \text{(Eqn. 2) (50)}$$

From equations (1) and (2), we take Y_1 and Y_2 as mutually dependent or endogenous variables and X_1 is an exogenous variable, u_1 and u_2 are the stochastic disturbance terms and the variables Y_1 and Y_2 are both stochastic. The stochastic explanatory variable Y_2 in (1) is not distributed independently of u_1 and the stochastic explanatory variable Y_1 in (2) is not distributed independently of u_2. The application of

Table 1. Description of the variables

Variable	Description of variable	Expected sign	Unit	Data sources
$lghg_{ijt}$	Natural logarithm of Total Annual Greenhouse Gas emission at a time 't' of i^th country	Dependent variable	Billion tonnes (co_2 eqv.)	Our World in Data, WDI (2002 to 2020)
$lirri\_land_{it}$	Natural logarithm of Irrigated Agricultural land of the country at time 't' of i^th country	+	'000 Hectare	WDI, KNOEMA, FAOSTAT, AQUASTAT, Statistical Yearbook (2010 to 2020)
$lliv\_stk\_em_{it}$	Natural logarithm of Emission from Livestock (Enteric fermentation) of the country at a time 't' of i^th country	+/-	Kilo tonnes	WDI, FAOSTAT (2010 to 2020)
lur_pop_{it}	Natural logarithm of the Urban population of the country at time 't' - Indexed (*Urban Intensity Index*) of the country	+/-	Index (%)	WDI (Urban Population) (2010 to 2020)
$lenrgy\_use_{it}$	Natural logarithm of Energy use (consumption) of the country at time 't' of i^th country	+/-	Million tonnes (co_2 eqv.)	IEA, WDI (2010 to 2020)
$lngdp_{it}$	Natural logarithm of GDP (absolute) of the country at time 't' of i^th country	+/-	USD (2015 constant)	WITS (2010 to 2020)
$lfdi_{it}$	Natural logarithm of Foreign Direct Investment (Inflow) emission of the country at a time 't' of i^th country	+/-	USD	WITS, WDI (2010 to 2020)

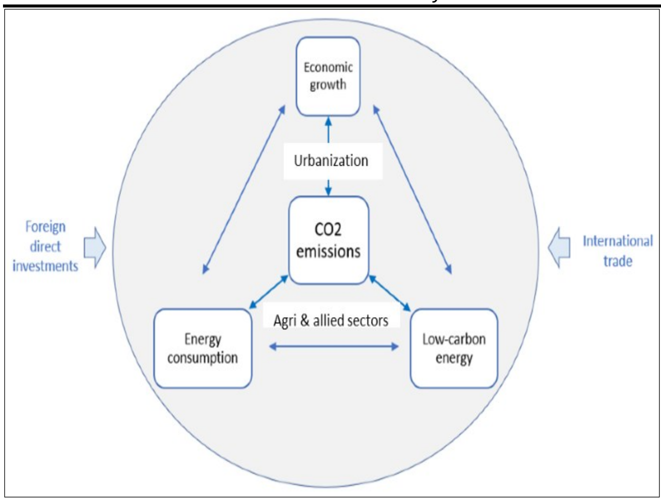

Fig. 2. Analytical Framework used in the study.

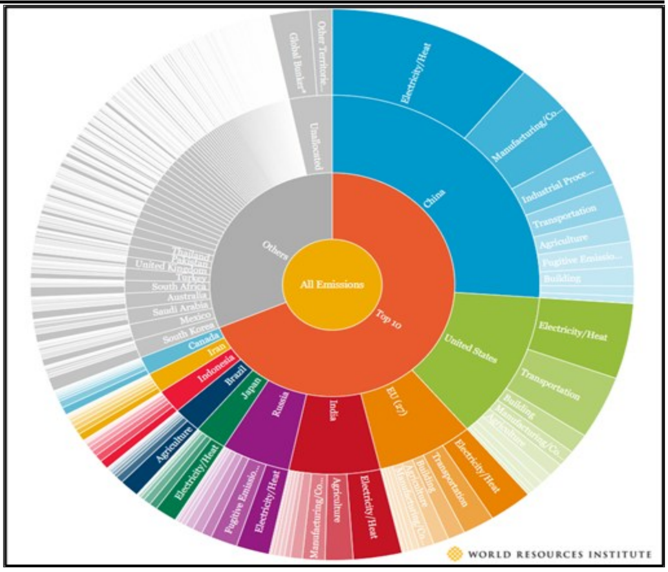

Fig. 3. Asian countries' contribution to global GHG emission Source: Climate Watch, WRI (2021).

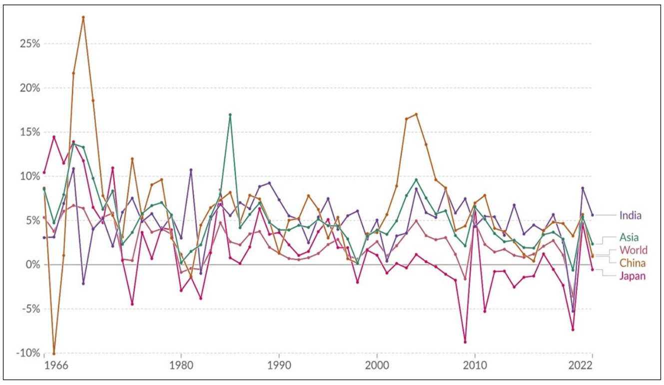

Fig. 4. Energy consumption trend of panel countries with Asia and World total. Source: Our World in Data (2023).

Ordinary Least Squares will lead to inconsistent estimates. The two significant variables included in the model are endogenous (stochastic values are determined within the model) and predetermined variables (non-stochastic and the values are determined outside the model). Exogenous (current and lagged) and lagged endogenous variables exist within the predetermined variables.

$$lghg_{ijt} = \beta_1 + \beta_2(lirri\_land_{it}) + \beta_3(lliv\_stk\_em_{it}) + \beta_4(lur\_pop_{it}) + \beta_5(lenrgy\_use_{it}) + \beta_6(lngdp_{it}) + \beta_7(lfdi_{it})$$

(Eqn. 3) (50)

Dynamic Panel Data Model

The panel data is the dataset that deploys the behaviour of each individual or entity and is observed over a period. The observations used in the study are the same for all the variables over all the years selected. So, the panel datasets are defined as balanced panels. The omitted variables use panel data that accounts for variables we cannot observe or measure. Panel data allow us to adjust for unobserved confounders while including lagged and endogenous regressors. However, attempting to perform both simultaneously causes significant estimate challenges. The econometric literature addresses these issues by combining lagged instrumental variables with the Generalized Method of Moments (GMM). When the time horizon is short, the most common estimate approach for models containing endogenous variables, mainly lagged dependent variables, is instrumental variables (IV) / GMMs. It showed that a GMM method incorporating moments of zero correlation and homoskedasticity is more efficient than least squares under fixed T. The fixed T framework was also studied earlier (50-51). GMM is treated as superior to Ordinary Least Square (OLS) fin heteroskedasticity and serial autocorrelation estimation. Panel estimation procedure can control potential endogeneity that emerges from explanatory variables. The regressors x_{it} can be strictly exogenous/ weakly exogenous/ predetermined and endogenous.

$$y_{it} = \sum_{j=1}^{q_y} \lambda_j y_{i,t-j} + \sum_{j=0}^{q_x} x'_{i,t-j}\beta_j + \alpha_i + u_{it}$$

(Eqn. 4) (52)

with many cross-sectional units $i = 1, 2, \ldots N$ & few time periods $t = 1, 2, \ldots T$. The unobserved unit-specific heterogeneity α_i can be correlated with the regressors $x_{i,t-j}$. It is correlated by construction with the lagged dependent variables $y_{i,t-j}$. The instrument variables are greater than the estimated parameters, i.e., L>K, which implies that the model was estimated under over-identified conditions. Here, L referred to the number of *IVs* and *K* indicated the number of parameters in the model.

Results and Discussion

The variables were initially analysed for the statistical conditions, as shown in supplementary Table S2. There is a robust negative correlation between livestock and GHG emission rates and a strong positive correlation between the GHG rate and variables like urban population, energy use, FDI and GDP. As the combination of cross-sectional and time series data features exists, it is necessary to check for the Classical Linear Regression Model (CLRM) violations before proceeding with the panel data regression analysis. It is a statistical method that analyzes the relationship between a dependent variable and one or more independent variables based on critical assumptions like linearity, random sampling, homoscedasticity and regular distribution of errors to provide the Best Linear Unbiased Estimator (BLUE). So, the datasets are first checked for stationarity and it was found that they possess unit roots and are stationary at their first differences.

Further, they are examined for violations such as multicollinearity, heteroscedasticity and autocorrelation. The results showed they are under the permissible level to carry out the GMM [Dynamic Panel Data Model]. Another important motivation for panel data analysis is to reduce the omitted variable bias (52). From the multicollinearity test results, allowing variables to correlate does not necessarily mean that one is a cause of the other, *i.e.* they may be associated because of some omitted common cause. There are two types of models in panel data analysis: fixed and random effects models. Another key motive for panel data analysis is the reduction of omitted variable bias (53). The cross-sectional unit -specific error, a_i, remains constant across time, but the idiosyncratic error, u_{it}, changes between units and time (52-57).

Linkages of Variables on the GHG Emission with Pooled OLS and Fixed and Random Effect Models

Using panel data, decomposing error terms into two pieces minimises omitted variable bias produced by unmeasured unit-specific variables. *Fixed effect model:* If the omitted variable correlates with included regressors, we analyze using the fixed effect (FE) model. The unobserved characteristics of individuals or entities correlated with regressors do not vary over time. Also, FE removes the effect of those time-invariant characteristics, which helps assess the net effect of the predictors on the outcome variables. *Random effect model:* Unlike the FE model, if the omitted variable is uncorrelated with included regressors, the random effect (RE) model is preferred over FE models. The main advantage of this model is that it tends to include time-invariant variables. The other reason for the RE model is that it is believed that differences across entities have some influence on the dependent variable. The data is found stationary in the first differencing. The tests were done to find the endogeneity using the Hausman test with biased and inconsistent estimator violations. The results indicate that endogeneity exists among the variables in the model. There is a strong negative and positive correlation between GHG emission rate and livestock emission and variables like urban population, energy use, FDI and GDP, respectively, with the primary statistical findings. This part of the paper includes all empirical results estimated by various estimation methods - pooled OLS model, cross-section fixed effect model, cross-section random effect model, Panel Correlated Standard Errors Model (PCES), Psuedo-Poisson Maximum Likelihood Model (PPML) and Generalized Method of Moments (GMM) models.

Linkages of Variables on the GHG Emission with PCSE, PPML and GMM Models

The linkages among the three different macroeconomic variables are estimated and examined using the various empirical models to over the linear model violations and to get unbiased and consistent estimators for better model interpretations. The pooled OLS and fixed and random effects models are initially estimated using the panel data set. Results of Table 2 revealed that the urban population and FDI inflows positively impact the GHG emission. According to the FAO, countries are ranked in terms of total emissions from agriculture (production and related land use processes). India stood third and the three top emitters together (58) contributed nearly 30 per cent to global agriculture emissions. There seems to be a negative but significant intercept from the estimation, indicating that irrespective of these variables selected, there has been a decrease in the annual emission rate, not due to the reduction in the economic activities but due to the increase in the forest-crop cover over the very recent years in the countries (59).

Table 2. Impact on GHG emission rate (OLS / FE / RE) *(Dependent variable: lghg)*

Variable	Pooled OLS	FE	RE
lirri_land	0.213*** (0.472)	0.003 (0.063)	0.213*** (0.472)
lliv_stk_em	0.148*** (0.045)	-0.045 (0.054)	0.149*** (0.045)
lur_pop	-0.022** (0.011)	-0.024** (0.010)	-0.022** (0.011)
lenrgy_use	0.742*** (0.036)	0.817*** (0.070)	0.742*** (0.036)
lgdp	0.825*** (0.009)	0.870*** (0.026)	0.825*** (0.009)
lfdi	0.000 (0.001)	-0.001 (0.001)	0.000 (0.001)
Intercept	-15.993*** (0.545)	-13.872*** (1.001)	-15.993*** (0.545)
Observations	90	90	90
R-square	0.99	0.40	0.98
		rho=0.95	rho=0.96
RESET value	*NA*	F(6,81) = 1282.85	Wald $chi^2(6)$ = 33740.71

Note: Values in parentheses indicates the standard error

****Indicates 1% level of significance ** Indicates 5% level of significance * Indicates 10% level of significance*

Fixed and random effect models are tested with the null hypothesis of accepting the FE model for the interpretations. In both cases, the FE model is better as the statistic values are lesser than the significance level of 5 per cent. Several studies of FAO indicated that crop and livestock production (60) is by far the dominant component of emissions due to agriculture in India and China. From the results, we experience that electricity represented nearly half of the total on-farm energy emissions, with gas and diesel oil as an additional one-third contribution (61). The Panel Correlated Standard Errors Model (PCSEs) estimates indicated that all the variables except urban population and FDI contribute positively to the GHG emission rate in the countries (Table 3). The model was tested for its significance with the Wald Chi^2 test and found to be significant.

Further, the endogeneity problem arises with the panel data and the variables taken up for the linkage studies. Thus, the Psuedo-Poisson Maximum Likelihood Model (PPML) would be better for estimating the models with the endogeneity issues. So, the estimation revealed the positive influence of enteric fermentation (*lliv_stk_em*) and was found to be significant along with the other variables, which are the same as from the PCSEs model estimates. Besides GDP and energy use, the PPML model depicts that a per cent increase in livestock emission and irrigated agricultural activities from the countries will significantly raise the GHG emission to a significant level (Table 3). The applicability of the findings implies that the urban population plays a critical role in the countries' continuing economic growth and the emission reductions achieved through policy and practice changes should prevail. Increasing energy efficiency, developing renewable energy resources and introducing new technologies for low-carbon energy will require widespread deployment.

Table 3. Impact on GHG emission rate (PCSEs / PPML/ GMM (one step diff.)) *(Dependent variable: lghg)*

Variable	PCSEs	PPML	Dynamic PDE (One step diff. GMM)
L1 (lghg)	-	-	0.613*** (0.056)
lirri_land	0.242*** (0.301)	0.007** (0.003)	-0.035 (0.034)
lliv_stk_em	0.118** (0.248)	0.016*** (0.003)	0.017 (0.029)
lur_pop	-0.009 (0.038)	-0.001* (0.000)	-0.010* (0.005)
lenrgy_use	0.741*** (0.045)	0.045*** (0.002)	0.407*** (0.055)
lgdp	0.822*** (0.022)	0.053*** (0.000)	0.367*** (0.049)
lfdi	-0.000 (0.074)	0.000 (0.000)	-0.000 (0.000)
Intercept	-15.987*** (3.198)	0.737*** (0.040)	-6.564*** (0.846)
Observations	90	90	90
R-square	0.99	0.99	*NA*
RESET value	rho=0.86 Wald chi^2 (6) =6582.19	*NA*	Wald chi^2 (7) = 27813.49

Note: Values in parentheses indicates the standard error

****Indicates 1% level of significance ** Indicates 5% level of significance *Indicates 10% level of significance*

Conclusion

This paper integrates energy use from the agriculture and livestock sectors, economic growth, GHG emissions and GDP in a multivariate format to track linkages using the panel data of three significant emitters in Asia. The current study identifies and improves our understanding of the link between chosen variables. More crucially, as exploratory research, the empirical results show that energy consumption directly influences GDP (a proxy for economic development) and affects GHG emissions across Asia. The results revealed that the urban population play an essential role in the continuous economic growth of the nations. Increasing energy efficiency, increasing renewable energy sources and introducing innovative low-carbon technologies without compromising economic growth to mitigate emission levels are the ultimate concerns for the countries. As CEEW reports after COP-28, the developed nations responsible for three-fourths of the attested emission rates are expected to emit more than 38 per cent by 2030 (62). However, Japan has been projected to cut its emissions by 45 percent by 2030 against the NDC target of 46 percent, following the countries Norway and Belarus. China's unique CCER mechanism, with its ability to modify the structure of energy production and consumption, has positioned to play a more critical role in boosting renewable energy to prevent global warming (63). Also, these projects are more likely to be implemented in locations where per capita GDP is lower, CO_2 emissions are higher and energy intensity is higher (64). India is in the initial stages of carbon markets alongside green energy generation, so the emission reduction target is far longer. Setting alternative assumptions for the energy structure and comparing findings across various energy consumption economies may be worthwhile to determine whether there is a difference.

An idea addressing the likelihood of global GHG emissions emphasises the need to transition carbon-intensive economies swiftly into green ones. Thus, to adopt such a strategy, more empirical evaluations are required to predict the related emitting sectors and the future mitigation potential of growth. This serves as a first guide for prioritising initiatives that promote sustainable development. Policymakers can then assess the potential for carbon reductions against other sustainability features of the action when deciding which policy to pursue after the Paris Convention.

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Authors' contributions

ENK carried out the study and analysed the data. KMS guided the research by formulating the research concept, helped secure research funds, approved the final manuscript and helped edit, summarize and revise the manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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