KEMENTERIAN EKONOMI
JABATAN PERANGKAAN MALAYSIA

Dependence and Sustainability: A Disaggregated Analysis of Electricity Generation in ASEAN Countries

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"Looking Beyond GDP: Towards Social Well-being and Environmental Sustainability"

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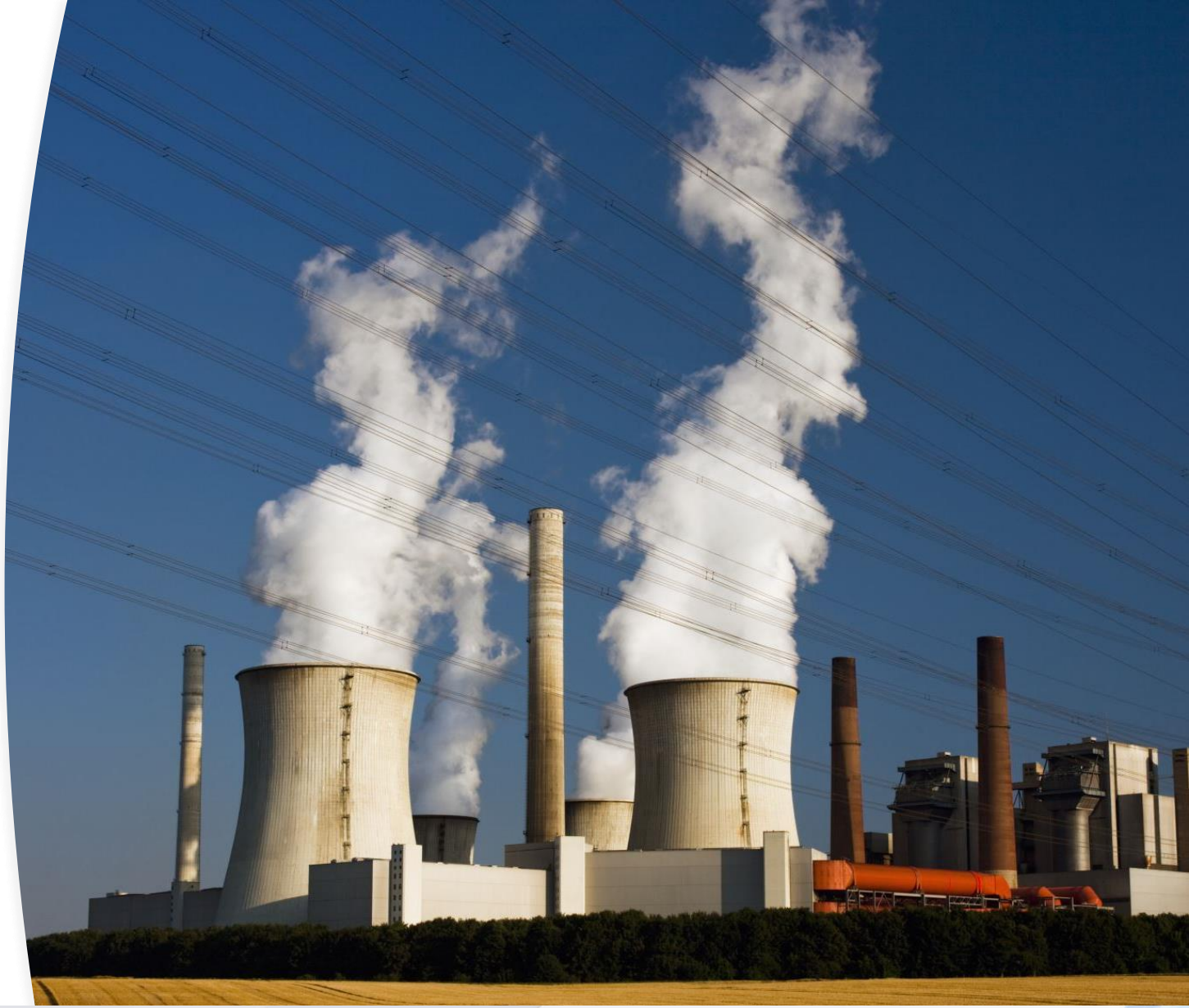
Introduction

- The rapid economic growth in ASEAN countries has increased energy demand.
- Electricity is a critical infrastructure sector that significantly impacts the economy's operation and progression.
- Southeast Asia relies heavily on fossil fuels for primary energy, raising concerns about carbon emissions and environmental impact.
- No research has examined the relationship between electricity production, environmental quality, and economic growth in Southeast Asian nations.



Introduction

- This study aims to examine the diverse sources of electricity generation and their associations with economic growth and environmental quality.
- The research hypothesis posits that fossil fuel-based electricity production (coal, oil, and natural gas) may offer cost-effective electricity, driving economic activity but potentially harming the environment through CO2 emissions.
- The study includes renewable power generation sources, especially hydroelectricity, in the analysis. It is based on existing literature suggesting that renewable sources can stimulate economic growth while reducing emissions.

Introduction

- The study employs a panel-based econometric analysis to analyze different electricity production sources' impact on economic growth and CO2 emissions in selected ASEAN countries (Indonesia, Malaysia, Filipina, Thailand, Vietnam, and Myanmar) from 1994 to 2014.
- The study will contribute to the growing literature by providing insights into energy economics, focusing on Southeast Asian countries, and examining the production side of electricity.

Data and Methods

Multiple Regression Model: To understand these relationships, the study employs an econometric model below.

- $GDP_t = \alpha_0 + \alpha_1 Coal_t + \alpha_2 Hyd_t + \alpha_3 Gas_t + \alpha_4 Oil_t + \varepsilon_t$ (1)
- $CO_2 = \beta_0 + \beta_1 Coal_t + \beta_2 Hyd_t + \beta_3 Gas_t + \beta_4 Oil_t + \mu_t$ (2)

- The model aims to examine relationships between electricity generation sources and CO2 emissions while considering their impact on economic growth.
- The results of this econometric model will provide insights into the complex dynamics between energy production, economic development, and environmental sustainability.

Result and Discussion

- The study employs three estimation methods: Ordinary Least Squares (OLS), Fixed Effect Model (FEM), and Random Effect Model (REM).
- Table 1 illustrates that electricity production from coal sources contributes to higher economic growth but significantly increases pollution through carbon dioxide emissions in six ASEAN countries.
- This poses a challenge to the environmental sustainability of these nations during their pursuit of economic growth.

Table 1. Panel Data Estimation

	Model 1 Dependent variable: GDP			Model 2 Dependent variable: CO_2		
Regressors	Common Effect	Fixed Effect	Random Effect	Common Effect	Fixed Effect	Random Effect
Coal	0.055	0.379**	0.215*	0.056	0.703***	0.638**
	(0.074)	(0.168)	(0.118)	(0.096)	(0.139)	(0.127)
Hydro	0.127**	0.386**	0.238**	-0.301***	0.261*	0.188
	(0.060)	(0.173)	(0.104)	(0.078)	(0.142)	(0.126)
Gas	0.054	0.355**	0.190*	0.032	0.494***	0.427***
	(0.057)	(0.170)	(0.105)	(0.073)	(0.140)	(0.124)
Oil	0.043	0.365**	0.197*	-0.234**	0.347**	0.281**
	(0.077)	(0.174)	(0.119)	(0.100)	(0.144)	(0.130)
Constant	-0.827	-29.24*	-13.91	45.29***	-6.29	0.167
	(5.934)	(16.06)	(10.24)	(7.69)	(13.27)	(11.97)
Hausman chi2		3.00			8.72	
Prob>chi2		0.559			0.069	

Result and Discussion

- Similar trends are observed for natural gas and oil, both being fossil fuel-based sources. The scenario where economic growth coincides with CO2 emissions could lead to environmental deterioration, affecting economic progress and public health.
- Conversely, hydroelectricity generation as a renewable energy source considerably enhances economic growth without negatively impacting environmental quality in these countries.
- This finding aligns with previous studies in various countries, emphasizing the positive environmental implications of hydroelectric power.
- The study's results suggest that hydroelectricity is an eco-friendly energy solution, with minimal effects on carbon dioxide emissions while significantly contributing to economic growth. This highlights the viability and sustainability of hydropower as a promising energy source.

Conclusion

- The research findings underscore the pivotal role of electricity generation in driving economic growth across six selected ASEAN countries. It highlights the essential nature of a reliable and diverse electricity supply in fostering economic development.
- The study emphasizes the environmental repercussions associated with different electricity production methods. It reveals that hydroelectric power has a minimal environmental impact, whereas fossil fuel-based electricity production, particularly from coal, is a significant contributor to carbon dioxide emissions.
- Additionally, the study points out the environmental impact of different electricity production methods, with hydroelectric power showing little impact, while fossil fuel-based electricity production, particularly from coal, is a major contributor to carbon dioxide emissions.
- Several policy recommendations are proposed to foster sustainable development in these ASEAN countries: (1) Promoting Hydroelectric Investments; (2) Reducing Coal Dependency; (3) Clean Coal Technology; (4) Collaborative Approach.

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