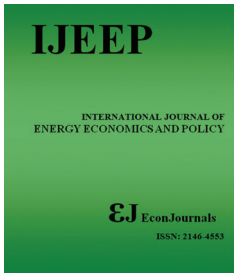

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What are Driving ASEAN's Environmental Commitments? Evidence from Multinomial Logit Model

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ABSTRACT

Environmental degradation continues to escalate despite ASEAN countries having ratified various global instruments such as the Ramsar Convention, Basel Convention, CBD, UNFCCC, AATHP, Stockholm Convention, Kyoto Protocol, and Paris Agreement. This condition is reflected in the low environmental performance index (EPI) scores, where most ASEAN countries rank near the bottom globally, indicating that international commitments have not translated into effective domestic implementation. This study aims to examine the factors driving variations in ASEAN countries' participation in international environmental agreements and to assess whether ecological pressures and socio-economic characteristics influence their engagement. Using a Multinomial Logit Model, the dependent variable is categorized based on the number of agreements ratified, while the independent variables include CO_2 emissions, GDP per capita, population growth, electricity consumption, trade openness, and population density. The dataset covers the period 1994-2024 and is sourced from the World Bank and ASEAN countries' ratification statuses of global environmental agreements. The results show that CO_2 emissions and population growth consistently increase the probability of a country falling into higher participation categories, while fossil-fuel-based electricity consumption and trade openness are negatively associated with multilateral commitments. GDP per capita and population density exhibit no significant effects. These findings indicate that ASEAN's participation in environmental agreements is more of an adaptive response to ecological pressures rather than a reflection of economic capacity or domestic technological readiness.

Keywords: Enviromental Commitments, Environmental Performance Index, ASEAN, Climate Change
JEL Classifications: Q54, Q56, Q43, F18, C25

1. INTRODUCTION

Climate change and environmental degradation have become major global challenges, including for countries in Southeast Asia. Over the past three decades, the international community has produced a range of global and regional agreements such as the Ramsar Convention, Basel Convention, CBD, UNFCCC, AATHP, Stockholm Convention, Kyoto Protocol, and Paris Agreement, all aimed at reducing emissions, protecting biodiversity, and preventing transboundary pollution. These legal instruments reflect a growing global awareness of the urgency of environmental protection, especially since the entry into force of the UNFCCC on 21 March 1994 as the foundation of international cooperation on stabilizing greenhouse gas concentrations. This effort was reinforced by the Kyoto Protocol, which entered into force on 16 February 2005, although its implementation was considered suboptimal due to political and economic challenges that led developing countries to feel disproportionately burdened. In response to these shortcomings, the Paris Agreement entered into force on 4 November 2016 with a more flexible and inclusive approach through Nationally Determined Contributions (NDCs), intended to encourage all countries, including ASEAN members, to transition toward low–carbon development.

However, as highlighted by (Boyle, 2018), the Paris Agreement remains heavily dependent on voluntary commitments without strong enforcement mechanisms, making developing regions such as ASEAN vulnerable to an implementation gap. The imbalance in historical responsibilities discussed by Leelakrishnan and Jayadevan (2019) further underscores that the principle of Common But Differentiated Responsibility (CBDR) has not been fully operationalized in the domestic policies of ASEAN countries that face development pressures and resource exploitation. In addition, structural distrust in climate negotiations (Scholtz and Ferreira, 2015) and domestic political factors Pierri and Grazia Melchionni, (2023); Zevin and Recio, (2018) continue to weaken the effectiveness of global commitments in the region.

The severity of environmental degradation in ASEAN becomes even clearer when examined through the Environmental Performance Index (EPI) 2024, developed by Yale University using 58 indicators across 11 environmental issue categories. With a scale of 0-100, higher scores indicate better environmental performance. The following EPI data show that most ASEAN countries are positioned near the bottom of global rankings:

The environmental performance of ASEAN countries is presented in Table 1, the low EPI scores of ASEAN countries indicate that the ratification of various environmental agreements has not translated into improved environmental performance, particularly in the core components assessed by the EPI: Climate change mitigation (30%), environmental health (25%), and ecosystem vitality (45%). Singapore is the only country in the region with the highest environmental performance, reaching 53.8 points.

This condition becomes more evident when viewed alongside empirical studies showing that economic growth, urbanization and population expansion, electricity consumption, and trade openness remain key drivers of environmental degradation in developing countries (Atil et al., 2019; Audi et al., 2025). Hasan et al. (2024) find that economic indicators such as GDP, FDI, and energy consumption significantly increase CO_2 emissions across countries, emphasizing that development pressures continue to dominate environmental dynamics, even within the context of global environmental diplomacy (Hasan et al., 2024).These findings are reinforced by studies in environmental diplomacy showing that international policies such as the Paris Agreement and other global legal instruments are insufficient to curb emissions without strong domestic commitments and consistent governance in implementing energy transition policies (Bodle et al., 2016).

At the same time, Thombs (2018) demonstrates that trade openness consistently raises carbon emissions, particularly in lower middle-income countries, as trade integration encourages fossil fuel-based industrialization and shifts pollution burdens from developed to developing economies. This empirical evidence is supported by studies in Malaysia revealing long run relationships among CO_2 emissions, energy consumption, and economic growth within the frameworks of the Environmental Kuznets Curve and the Urban Environmental Transition. Bekhet et al. (2020) show bidirectional relationships between energy consumption, carbon emissions, and economic growth, highlighting the critical roles of population growth, electricity consumption, and GDP per capita in accelerating environmental degradation. A similar pattern is observed in Vietnam, where population growth, industrialization, and urban expansion continue to increase emissions despite rising shares of renewable energy, indicating that the validity of the EKC depends more on energy policy quality and governance than income levels alone.

Meanwhile, other forms of ecological degradation, such as deforestation and microplastic pollution in Malaysia Sheriff and Adams (2025) illustrate that the ratification of conventions such as the CBD, Ramsar Convention, or Basel Convention has not resulted in effective ecological protection. Weak rule of law in environmental governance further increases the risk of implementation failure, as environmental law enforcement requires strong institutional capacity and regulatory stability, both of which remain significant challenges in several ASEAN countries (Polcini, 2017).

The economic complexity and global integration of ASEAN also intensify ecological pressures, as documented by Prince Nathaniel (2021) and supported by Doğane et al. (2022) regarding rebound effects in developing economies. Moreover, weak democratic quality and governance in certain ASEAN countries hinder emission reduction efforts Phrakhruopatnontakitti et al. (2020) while the principles of environmental democracy and human rights protection embedded in global environmental agreements are yet to be fully reflected in domestic policies. Furthermore, the environmental security dimension highlighted by Arya et al. (2021) warns that failures in implementing environmental agreements may trigger regional instability through disasters, climate induced migration, and resource conflicts.

Although ASEAN countries have ratified numerous international environmental agreements, the region's environmental quality continues to deteriorate, indicating that these commitments have not been followed by effective implementation. While various developmental indicators such as CO_2 emissions growth, GDP per capita, accelerated population growth, rising electricity consumption, trade openness, and population density are consistently identified as drivers of environmental degradation in many developing countries, it remains unclear whether these dynamics also influence the level of ASEAN countries' participation in ratifying global environmental agreements. The variation in the number of agreements ratified across ASEAN countries raises the question of whether ecological pressures and socioeconomic characteristics motivate ratification or whether they are unrelated altogether. In other words, it is still uncertain whether CO_2 emissions, GDP per capita, population growth, electricity consumption, trade openness, and population density are truly correlated with a country's decision to expand its international environmental commitments.

2. MATERIALS AND METHODS

This study examines the relationship between the number of environmental agreements ratified by ASEAN countries and their ability to address environmental degradation. The Multinomial Logit Model is employed as the most relevant and representative methodological approach. This choice is driven by the nature

of the dependent variable, namely the number of international environmental agreements ratified, which is more appropriately mapped into discrete categories such as low, medium, and high. As such, it cannot be analyzed using ordinary linear regression. The Multinomial Logit Model allows the researcher to estimate the probability of each country falling into a particular category based on variations in environmental and socioeconomic conditions, including CO_2 emissions, GDP per capita, population growth, electricity consumption, trade openness, and population density. These variables have been identified in previous studies as key determinants of environmental degradation and environmental diplomacy behavior. As shown in Hasan et al. (2024) environmental pressures and economic factors often shape national diplomatic strategies and their engagement with international environmental agreements, while Thombs (2018) finds that trade openness can increase transnational pressures that encourage countries to adopt more global commitments. The variables used in this study are therefore theoretically relevant for explaining ASEAN's participation patterns. Selecting the Multinomial Logit Model enables the relationships among these variables to be analyzed probabilistically and in a non-linear manner, allowing the model to capture strategic state choices that cannot be explained by conventional linear regression. Thus, the Multinomial Logit Model provides a robust analytical framework to address the main research question: Whether environmental pressures and economic and demographic characteristics shape ASEAN countries' likelihood of adopting a greater number of environmental agreements, or whether such decisions are instead driven by political and diplomatic considerations unrelated to domestic conditions. The model is aligned not only with the characteristics of the data and variables but also with the theoretical and empirical literature.

Table 2 reports the definitions, abbreviations, and sources of all variables used in the study. To examine the determinants of ASEAN countries' participation in international environmental agreements, this study employs a Multinomial Logit Model with seven ratified agreements as the base outcome. Let Y_{it} denote the number of environmental agreements ratified by country I in year t. The model is specified as follows:

$$\ln\left(\frac{\Pr(Y_{it}=j)}{\Pr(Y_{it}=7)}\right)=\alpha_j+\beta_{1j}CO_{2it}+\beta_{2j}GDP_{it}+\beta_{3j}POP_{it}+\beta_{4j}Elect_{it}+\beta_{5j}Trade_{it}+\beta_{6j}Popden_{it},\forall j\neq 7 \quad (1)$$

The coefficients β_j capture how environmental, economic, energy, and demographic factors influence the relative likelihood that a country ratifies a given number of environmental agreements j, compared to the reference category of seven agreements. This specification allows for non-linear and probabilistic analysis of state participation in international environmental regimes.

3. RESULTS AND DISCUSSIONS

This study focuses on the ASEAN region and incorporates various environmental and socioeconomic conditions as determinants of state participation in international environmental agreements. This approach is relevant because ASEAN member states have ratified a substantial number of global instruments, including the Ramsar Convention, Basel Convention, CBD, UNFCCC, AATHP, Stockholm Convention, Kyoto Protocol, and the Paris Agreement, as part of their efforts to address ecological degradation. Given that the dependent variable in this study represents the number of international environmental agreements ratified, which is more appropriately categorized into low, medium, and high engagement levels, linear regression is no longer suitable. Therefore, the Multinomial Logit Model is employed as the most relevant and representative methodological approach, as it enables the estimation of the probability that each country falls into a particular engagement category based on variations in factors such as CO_2 emissions, GDP per capita, population growth, electricity consumption, trade openness, and population density. The model allows for a more robust analysis of discrete choices and provides empirical insights into how internal conditions influence a country's level of commitment to global environmental agreements. The estimation results of the Multinomial Logit Model are reported in Table 3.

Table 1: Environmental performance index (EPI) ASEAN 2024

Country	EPI score	World rank
Vietnam	24.5	180
Laos	26.1	178
Myanmar	26.9	177
Camboja	31	170
Filipina	32	168
Indonesia	33.8	162
Malaysia	41.2	117
Thailand	45.4	91
Brunei Darussalam	48.5	68
Singapura	53.8	44

Source: EPI 2024

Table 2: Descriptive time-series variable

Variable	Abbreviation	Data range	Source
The total of agreement	Agreement	1994-2025	-
CO_2 per capita (metric ton)	CO_2	1994-2024	World Bank
Gross domestic product per capita (USD)	GDP	1994-2024	World Bank
Population Growth	POP	1994-2024	World Bank
Electric Power consumption (kWh per capita)	Elect	1994-2024	World Bank
Trade opens (% GDP)	Trade	1994-2024	World Bank
Population density (people per sq. km of land area)	Popden	1994-2024	World Bank

The total of agreement is based on Ramsar, Basel, CBD, UNFCCC, AATHP, Stockholm, Kyoto Protocol and Paris Agreement

The findings of the Multinomial Logit Model indicate that ASEAN countries' participation in international environmental agreements is not homogeneous but is shaped by structural dynamics that differentiate each country's incentives. In particular, CO_2 emissions and population growth emerge as the most consistent and significant determinants associated with

Table 3: Estimation of multinomial logit model

Agreement	Coef.	St. Err.	t-value	Interval	Sig.
Ratification 0 agreement					
CO_2	55.279	104.632	2.12	2257.975	**
gdp	1.001	0.001	1.06	1.004	
pop	8.26	4.718	3.70	25.303	***
elect	0.973	0.016	−1.70	1.004	*
trade	0.94	0.057	−1.02	1.059	
popden	1.019	0.014	1.38	1.046	
Constant	0.067	0.246	−0.74	86.806	
Ratification 1 agreement					
CO_2	3.105	1.274	2.76	6.94	***
gdp	1	0	2.76	1.001	***
pop	5.095	3.274	2.53	17.956	**
elect	0.996	0.001	−3.02	0.999	***
trade	0.997	0.012	−0.24	1.021	
popden	1	0.001	−0.60	1.001	
Constant	0.01	0.014	−3.38	0.144	***
Ratification 2 agreement					
CO_2	1.049	0.46	0.11	2.476	
gdp	1	0	1.94	1.001	*
pop	7.216	3.425	4.16	18.295	***
elect	0.999	0.001	−1.12	1.001	
trade	0.979	0.009	−2.35	0.996	**
popden	0.999	0.001	−1.01	1.001	
Constant	0.137	0.122	−2.24	0.78	**
Ratification 3 agreement					
CO_2	4.027	1.487	3.77	8.305	***
gdp	1	0	0.11	1	
pop	0.911	0.496	−0.17	2.649	
elect	0.997	0.001	−2.88	0.999	***
trade	1	0.009	−0.03	1.018	
popden	1.001	0.001	2.38	1.003	**
Constant	0.147	0.136	−2.07	0.9	**
Ratification 4 agreement					
CO_2	3.749	1.333	3.72	7.524	***
gdp	1	0	0.89	1	
pop	4.273	1.929	3.22	10.35	***
elect	0.997	0.001	−3.60	0.998	***
trade	0.996	0.007	−0.63	1.009	
popden	1.001	0.001	1.22	1.002	
Constant	0.113	0.081	−3.05	0.46	***
Ratification 5 agreement					
CO_2	2.025	1.251	1.14	6.795	
gdp	1	0	0.12	1	
pop	0.41	0.239	−1.53	1.286	
elect	0.997	0.002	−1.70	1	*
trade	1.001	0.01	0.15	1.021	
popden	1.002	0.001	1.75	1.004	*
Constant	1.187	1.155	0.18	7.985	
Ratification 6 agreement					
CO_2	2.013	0.558	2.52	3.466	**
gdp	1	0	0.81	1	
pop	1.028	0.518	0.05	2.76	
elect	0.999	0.001	−2.41	1	**
trade	0.982	0.008	−2.37	0.997	**
popden	1.001	0.001	1.43	1.002	
Constant	1.293	0.975	0.34	5.671	
Ratification 7 agreement "*baseoutcome*"					
Ratification 8 agreement					
CO_2	0.78	0.126	−1.54	1.07	
gdp	1	0	1.12	1	
pop	0.354	0.109	−3.36	0.648	***
elect	1	0	0.71	1	
trade	0.993	0.005	−1.42	1.003	
popden	1	0	−0.23	1.001	
Constant	7.372	4.068	3.62	21.743	***
Mean dependent var	5.755		SD dependent var		2.231
Pseudo r-squared	0.233		Number of obs		310
Chi-square	270.156		Prob>chi^2		0.000
Akaike crit. (AIC)	1002.438		Bayesian crit. (BIC)		1211.686

***P<0.01, **P<0.05, * P<0.1

higher levels of participation. This suggests that the interaction between environmental pressure and demographic burden creates objective conditions that compel states to adopt global mitigation strategies. Unlike purely economic variables such as GDP per capita, which are often viewed as indicators of policy capacity, these two variables reflect systemic risks that cannot be managed unilaterally. Under such circumstances, multilateral diplomacy becomes an instrument for reducing structural vulnerabilities. In contrast, economic structure variables, especially electricity consumption and trade openness, largely display negative or insignificant coefficients, indicating resistance toward international obligations when domestic growth models remain dependent on fossil energy and resource-based exports.

These findings clarify the direction of the relationship between environmental degradation and international diplomacy. Countries with high emissions face direct consequences for air quality, public health, productivity losses, and energy instability. Literature on the mechanisms of the Paris Agreement emphasizes that the global mitigation system is designed to integrate emission reduction with sustainable development. Veronica Puno (2021) notes that its mechanisms explicitly aim to "promote the mitigation of greenhouse gas emissions while fostering sustainable development," implying that countries with high environmental exposure are driven to seek multilateral legitimacy and support. The stable positive relationship between CO_2 emissions and ASEAN countries' participation in international environmental agreements signals an adaptive response pattern. Burki and Tahir (2022) observe that "rising CO_2 emissions have made the ASEAN region increasingly vulnerable to climate change challenges," suggesting that emission growth is not merely an economic by-product but a source of heightened structural risk for social and environmental systems. In this context, multilateral cooperation is pursued not as a normative preference but as an external mitigation strategy for domestic policy failures. A similar phenomenon is evident in Indonesia, where Setiawan and Anwar (2022) show that the ratification of the Kyoto Protocol did not lead to meaningful emission reductions. This strengthens the interpretation that international engagement often functions as policy legitimation or reputational diplomacy rather than evidence of successful domestic energy transition. From this perspective, high-emission states join environmental agreements not because they are ready but because they have limited rational alternatives to avoid long-term consequences. This condition aligns with the transnational treadmill of production, which argues that export-oriented and resource-intensive economies continue to increase emissions due to global market pressures and capital accumulation (Thombs, 2018). As countries integrate into open trade systems, production expansion and logistical activities intensify their carbon footprint, making environmental diplomacy a tool for mitigating reputational pressure rather than addressing the underlying drivers of emissions.

The insignificance of GDP per capita in the model challenges the Environmental Kuznets Curve (EKC) hypothesis often associated with high-income countries. ASEAN does not follow the classic inverted-U pattern but instead exhibits an N-shaped EKC, in which early-stage growth increases environmental degradation, followed by a temporary decline, and then a renewed rise at later

stages. This finding illustrates that structural transformation in ASEAN has not yet reached a phase in which environmentally friendly technologies dominate, as growth regimes continue to rely on extractive industrialization and carbon-intensive energy. Moreover, the lack of significance of GDP per capita indicates the failure of key assumptions in the classical EKC. The EKC argues that at a certain income level, countries shift toward cleaner technologies, causing pollution to decline. Saydaliev and Chin (2023) show that the relationship between economic development and social stability is often non-linear: Economic growth without institutional reform can exacerbate macroeconomic and environmental vulnerabilities, leading to increased state expenditure without achieving long-term stability. In other words, national income is not an indicator of decarbonization readiness. In the ASEAN context, industrialization remains extractive and materially expansive rather than technologically clean, and the empirical findings of the Multinomial Logit Model therefore reveal the absence of a meaningful link between GDP per capita and international engagement.

This pattern is further clarified by the findings of Albassam et al. (2025), which indicate that rising GDP per capita in the early stages of development indeed contributes to higher CO_2 emissions. However, emission reductions only occur when two conditions are met: Stable environmental policy and rapid adoption of renewable energy. Their study underscores that renewable energy use consistently lowers emissions, whereas policy uncertainty increases emissions systemically by weakening investment in clean technology and delaying the adoption of environmental regulations. These findings suggest that, for developing countries, the trajectory of the Environmental Kuznets Curve (EKC) is shaped not only by income levels but also by the interaction between fiscal policy, technological development, and the prevailing energy structure. Cross-sectoral literature further shows that the complexity of industrial structures affects the form of the EKC. Montagna et al. (2025) demonstrate that economies dependent on energy-intensive sectors such as primary manufacturing or resource extraction tend to display either a linear pattern or an N-shaped curve, as advanced-stage production expansion triggers renewed increases in emissions due to surging energy demand and limited innovation capacity in traditional sectors. In contrast, economies with technology-based sectoral complexity are more likely to follow an inverted-U curve because they are able to substitute energy sources and reorient production toward knowledge-intensive industries.

Population growth exhibits a positive and significant coefficient, indicating that countries with larger populations face higher social and political costs when environmental degradation escalates. This aligns with the findings of Saydaliev and Chin (2023), who argue that environmental mitigation efforts affect not only emissions but also macroeconomic stability and population welfare, making environmental governance an institutional necessity for high-population economies. The consistent influence of population growth reinforces this argument. Large populations intensify social burdens when environmental quality deteriorates, including higher incidence of respiratory illnesses, rising public health expenditures, declining productivity, land-use conflicts, and energy instability. Consequently, participation in multilateral agreements becomes a strategy to distribute mitigation costs and gain international legitimacy. Parallel evidence from agricultural and environmental economics shows that demographic pressure accelerates resource depletion through intensified land, energy, and water use, linking rising demand for food and energy to higher CO_2 emissions and declining ecological stocks. Participation in environmental agreements, therefore, reflects not environmental idealism but a survival logic. In such contexts, ratification serves as a risk mitigation mechanism, as countries with large populations incur higher long-term costs if environmental degradation remains unaddressed.

The model shows that electricity consumption based on fossil energy and trade openness are negatively associated with multilateral participation. This negative relationship does not stem from ideological resistance to environmental agendas but reflects structural lock-in to carbon-intensive energy systems. Morgenthau and Reisch (2020) demonstrate how resource extraction structures often generate social conflicts and rights-based environmental litigation, as local communities are forced to pursue legal action to counter the expansion of fossil energy industries. This highlights a critical insight: Countries dependent on fossil-based energy systems have defensive incentives toward international commitments because domestic industrial survival fundamentally conflicts with decarbonization requirements.

The negative effect of trade openness carries additional implications. Integration into global markets makes the industrial and export sectors of Indonesia, Vietnam, and Thailand heavily dependent on energy-intensive production systems, ranging from heavy manufacturing and petrochemicals to metals and intensive agribusiness. Formal commitments to emission-restricting agreements impose regulatory costs that risk triggering carbon leakage, where production relocates to jurisdictions without environmental regulations. Consistent with this, Slechten and Verardi (2016) find that participation in cross-border air pollution treaties reduces CO_2 emissions globally, but the magnitude of the reduction depends heavily on the extent of participation and the coordination of environmental policies. As a result, export-oriented economies may hesitate to join agreements if they perceive others as potential free riders. This explains why trade openness does not increase participation in the ASEAN context. An equally important finding emerges from electricity consumption, which consistently exerts a negative influence on participation. This pattern reflects fossil lock-in, a condition in which domestic energy systems are structurally tied to nonrenewable resources. Setiawan and Anwar (2022) observe that fossil energy consumption continues to indicate national dependence on nonrenewable energy sources, suggesting that energy transition is not merely a technological issue but one deeply embedded in macroeconomic design.

A similar dynamic appears in the case of trade openness. The empirical results show a negative coefficient, indicating that export-oriented economic models weaken incentives to comply with global environmental regimes. Burki and Tahir (2022) note that "increasing energy consumption, trade openness, and financial development positively contribute to environmental degradation

in ASEAN economies," implying that trade activity reinforces the region's carbon intensity. The energy embedded in production chains, ranging from heavy manufacturing to primary resource extraction, generates resistance to regulations that could reduce competitiveness.

Population density, however, does not exert a consistent effect in the model. This finding suggests that environmental pressures are not determined solely by spatial constraints, but by energy structure, industrialization, and the character of urbanization. Aung et al. (2017) even find that "trade and financial openness have inverse relationship with CO_2 emissions," indicating that institutional factors can offset demographic pressures. Such dependence creates political resistance to multilateral commitments because international agreements typically require costly decarbonization measures that may threaten industrial stability. Evidence from the energy literature reinforces this barrier. Al Mubarak et al. (2024) show that fossil fuels "generate the highest greenhouse gas emissions and have the highest adverse impacts on ecosystems," while clean energy alternatives face scaling limitations and high investment costs. As a result, countries that remain reliant on fossil energy tend to adopt defensive strategies toward international commitments, driven not by ideological opposition but by economic calculation.

Finally, population density does not exhibit consistent effects in the model. This indicates that ecological pressures are shaped not merely by spatial distribution, but by institutional capacity to manage resources, mitigate conflict, and support subsistence technologies. As Veronica Puno (2021) emphasizes, environmental mitigation cannot be understood solely as a CO_2-reduction target, but must be integrated with social protection, community rights, and the participation of local economic actors in the transition process. Thus, population size does not become a primary determinant of international engagement unless it is linked to institutional capability. High population density does not automatically increase multilateral commitment in the absence of structural transformation. Taken together, these findings emphasize that the environmental engagement of ASEAN countries reflects responses to ecological risk rather than outcomes of economic capacity. States experiencing high environmental pressure have strong incentives to participate multilaterally, whereas those dependent on fossil energy and export-oriented production tend to delay commitment. This illustrates an asymmetry between ecological necessity and economic pragmatism, in which international cooperation emerges as a reactive rather than transformational strategy.

4. CONCLUSION

Overall, the results confirm that ASEAN countries do not enter environmental agreements as indicators of economic capacity, but rather as adaptive responses to accumulating ecological risks. Threat-based determinants, such as emissions and population, encourage participation, whereas structure-based determinants, such as trade and energy, delay commitment because the costs of transition outweigh the short-term benefits. Consequently, international cooperation in the region emerges not as a mature institutional transformation, but as a defensive mechanism to reduce exposure to increasingly complex environmental and social threats.

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