

The Role of Income Class and Regional Development in Shaping Pro-Environmental Behaviors in Indonesia

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Abstract. This study investigates the factors influencing private-sphere pro-environmental behavior (PEB) using a national longitudinal dataset, focusing on income class, provincial macroeconomic conditions, and their interactions. By applying a multilevel mixed-effects logistic model, the research highlights disparities in resource access and the barriers lower-income populations face. The analysis covers three PEB measures: energy conservation, water conservation, and waste management, contributing to a deeper understanding of social stratification's impact on PEB. The findings reveal that higher-income individuals are more likely to conserve water. Lower-middle and upper-middle-income groups conserve energy more frequently yet participate less in waste sorting. Provincial economic conditions significantly shape PEB patterns. A higher Human Development Index (HDI) fosters water and energy conservation and moderates income-based disparities in sustainability practices. These results suggest that financial resources alone do not determine sustainability behaviors, as social norms and habitual practices also play key roles. The study's findings provide policy recommendations to enhance public engagement in PEB, offering a promising path for positive change.

Keywords. income class, Indonesia, macroeconomic conditions, multilevel mixed-effects logistic model, pro-environmental behavior

1. Introduction

Indonesia faces a significant challenge balancing economic growth with environmental sustainability [1]. This is evident in the sharp decline of the country's Environmental Performance Index (EPI), which dropped from 37.8 in 2020 (ranked 116th out of 180 countries) to 33.8 in 2024 (ranked 162nd) [2, 3]. While Indonesia's 2025–2045 development plan prioritizes sustainable growth, achieving this vision requires broad-based adoption of pro-environmental behavior (PEB) across socio-economic groups. Therefore, understanding what drives PEB is crucial to reversing environmental decline and integrating sustainability into national development strategies.

PEB refers to individual actions that minimize environmental harm and support ecological protection [4, 5]. These behaviors are generally categorized into private-sphere actions, such as conserving energy and reducing waste, and public-sphere actions, such as activism or advocacy [4]. This study focuses on private-sphere PEB, as everyday actions—when widely adopted—can collectively generate significant environmental benefits and reinforce broader policy interventions.

A growing body of research identifies several key drivers of PEB. Contact with nature has been found to encourage environmentally friendly behaviors, particularly in wildlife conservation [6], while participation in such behaviors is associated with enhanced well-being [7]. Social norms also matter—especially those subtly induced in individualistic cultures [8]. Place attachment is another strong motivator, particularly in collectivist settings and among tourists [9]. Additionally, behavioral intentions—shaped by moral norms, attitudes, and perceived control—play a critical mediating role [10]. These studies underscore the importance of psychological and social influences, but they often overlook structural barriers, especially economic disparities, that may constrain access to sustainable choices.

In the Indonesian context, most PEB studies have focused on social and cultural dimensions such as self-image [11], social networks [12], media influence [13], environmental knowledge and values [14], and religiosity [15]. However, these studies are often limited in geographic scope, with only one using nationally representative data [12]. Few have examined how economic status shapes individuals' capacity to engage in PEB despite its potential to influence both access to sustainable options and environmental awareness.

This study addresses these gaps by examining private-sphere PEB from a structural perspective, emphasizing socio-economic and macroeconomic influences rather than individual psychological traits. Using nationally representative data, it explores three key research questions:

- RQ1: How does income class influence PEB adoption?
- RQ2: How do regional macroeconomic factors influence engagement in PEB?
- RQ3: How do regional economic conditions shape income-based disparities in PEB engagement?

Income class can affect PEB by determining access to education, infrastructure, and motivations. Higher-income individuals may adopt sustainable behaviors more easily, whether due to ethical concerns or status, while lower-income groups often face financial constraints. Moreover, macroeconomic conditions such as the Human Development Index (HDI) may shape both access to sustainable infrastructure and the effectiveness of environmental policies across regions.

This study offers a comprehensive analysis of the drivers of PEB in Indonesia by applying a multilevel modeling approach that accounts for both individual and provincial characteristics. It focuses on routine environmental actions such as water and energy conservation and waste management, shedding light on how structural inequalities shape behavioral outcomes. The findings aim to inform inclusive sustainability policies that remove economic barriers to environmental engagement.

2. Materials and Methods

2.1. Data, Definitions of PEB Indicators, and Income Class

This study draws on data from the 2021 Happiness Level Measurement Survey (SPTK) conducted by Indonesia's Central Statistics Agency (BPS) [16]. The SPTK provides a nationally representative dataset covering all provinces and districts, with 74,684 households participating. The head of the household or their spouse was interviewed as the respondent. The 2021 survey includes a module on environmental awareness, which forms the basis for the three pro-environmental behaviors (PEB) indicators used in this study.

These indicators are adapted from BPS's Environmental Indifference Behavior Index (IPKLH) [17], developed in collaboration with international partners and based on the UK's Department for Environment, Food and Rural Affairs framework. The IPKLH measures household-level environmental behavior across four dimensions: water management (4 indicators), air pollution through private transportation (3), energy management (6), and waste management (4).

This analysis focuses on three PEB indicators representing water, energy, and waste management. Consistent with the original IPKLH definitions, this approach ensures policy relevance and supports evidence-based environmental policymaking in Indonesia. While improvements to these indicators are possible, such refinements lie beyond the scope of this study. The selected PEB indicators are:

- The variable for turning off the water tap when not in use was derived from responses to the question, "How often did you turn off the lights in the last month when not in use?" This variable is associated with the energy management dimension. Responses of "always" or "often" were coded as 1, while responses of "sometimes" or "never" were coded as 0. This variable pertains to the water conservation dimension of the IPKLH.
- The variable measuring the habit of turning off lights when not in use was based on responses to the question, "How often do you turn off the water tap when not in use?" Responses of "always" or "often" were assigned a code of 1, while responses of "sometimes" or "never" were assigned a code of 0. This variable contributes to the water management dimension within the IPKLH.
- The variable for sorting wet and dry waste was derived from responses to the question, "How often do you sort wet waste (easily decomposed) and dry waste (not easily decomposed)?" This variable pertains to the waste management dimension within the IPKLH. Responses of "always" or "often" were coded as 1, while responses of "sometimes" or "never" were coded as 0. This variable focuses on the waste management dimension of the IPKLH.

Together, these three indicators offer meaningful insights into PEB across the key dimensions of the IPKLH. These behaviors are critical in advancing sustainability goals and are reinforced by national policy frameworks. For example, the Law on Waste Management emphasizes the necessity of effective waste handling at the household level, while the Ministerial Regulation on Electricity Consumption Savings promotes responsible energy use. The Presidential Instruction on Energy and Water Conservation also calls for prudent water and energy management. These regulations collectively highlight the importance of everyday environmental practices and underscore the relevance of the selected indicators in supporting Indonesia's sustainability agenda.

This study categorizes household income into four groups: low, lower-middle, upper-middle, and high income. The low-income group includes households earning less than IDR 1.8 million per month. Lower-middle-income households earn between IDR 1.8 million and IDR 3.0 million, while upper-middle-income households fall between IDR 3.0 million and IDR 4.8 million. Due to limited observations in the highest brackets, the top two categories—IDR 4.8 million to less than IDR 7.2 million and IDR 7.2 million or more—are combined into a single high-income group. The distribution is relatively balanced: 28.5% low-income, 31.4% lower-middle, 20.3% upper-middle, and 19.8% high-income, supporting robust comparisons across classes. Figure 1 presents the prevalence of the three PEB indicators across these income groups, which is central to this study's analysis.

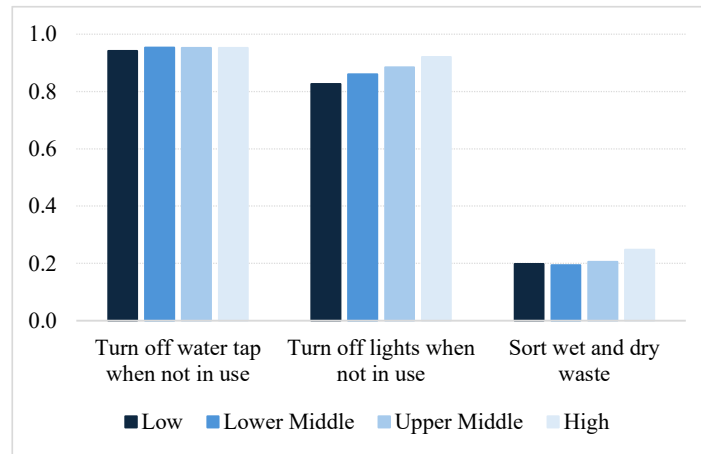


Figure 1. Propensity of PEB by Income Class, 2021
 Source: Author's calculations

Turning off the water tap when not in use shows consistently high adherence across all income groups, with approximately 95% of respondents reporting this behavior. In contrast, turning off lights when not in use increases with income, rising from 82.7% among low-income individuals to 92.1% among high-income individuals. Waste sorting remains relatively stable at around 20% among low- to upper-middle-income groups but increases to 24.8% among high-income households. These patterns indicate that income class differentially influences specific environmental behaviors. As such, combining all behaviors into a single composite index may obscure important behavioral distinctions and reduce the precision of policy targeting.

2.2. Methodology

This study highlights how income levels and regional economic conditions shape everyday PEB in Indonesia, a critical focus amid the country’s declining environmental performance. While many relevant policies are implemented at the district level—the second tier of subnational government—this analysis relies on province-level data due to dataset limitations. Provinces, as the first tier of subnational government, still provide valuable insights into macroeconomic disparities and policy contexts.

To examine these relationships, the study employs a multilevel mixed-effects logistic model suitable for both the binary nature of the dependent variable and the hierarchical data structure, with individuals (level 1) nested within provinces (level 2). This approach incorporates random intercepts to account for unobserved heterogeneity across provinces and captures variations in regional socioeconomic conditions. It allows for a robust analysis of how income class and macroeconomic context influence the likelihood of engaging in PEB [18].

The empirical model introduces a latent variable representing the unobserved probability of engaging in PEB, which is estimated based on individual characteristics, household attributes, and province-level contextual variables:

$$y_{ij}^* = x_{1ij}\beta_1 + x_{2j}\beta_2 + z_{ij}u_j + \epsilon_{ij}$$

The relationship between the observed binary variable y_{ij} and the latent y_{ij}^* is defined by a simple measurement equation:

$$y_{ij} = \begin{cases} 0 & \text{if } y_{ij}^* > 0 \\ 1 & \text{if } y_{ij}^* \leq 0 \end{cases}$$

where y_{ij}^* is the unobserved probability of engaging in PEB, $x1_{ij}$ represents the individual and household characteristics of individual i living in province j ; $x2_j$ represents the province contextual variables for province j ; z_{ij} denotes the covariates corresponding to the random effects; since this model follows a random intercept model, z_{ij} is simply the scalar 1; u_j represents the random effects; and ϵ_{ij} represents the errors, distributed as logistic with mean 0 and variance $\pi^2/3$ and are independent of u_j .

Individual-level variables include gender (female, with male as the reference), age, marital status (married, with unmarried—encompassing never married, divorced, or widowed—as the reference), and educational attainment (primary, junior secondary, senior secondary, and tertiary, with no formal education as the reference category). Household-level variables consist of urban residence (with rural as the reference) and length of stay in the current location. At the provincial level, the contextual variable used is the Human Development Index (HDI), which captures overall social and economic development.

Although the SPTK survey was conducted during the peak of the COVID-19 pandemic (July 1–August 27, 2021), pandemic-related indicators were excluded to maintain a focus on the long-term structural influences of income class and macroeconomic conditions on pro-environmental behavior (PEB). Including COVID-19 variables could obscure the broader economic and social mechanisms shaping environmental behavior. Evidence from the Czech Republic [19] supports this approach, showing that while the pandemic affected specific PEBs, it did not fundamentally alter the motivations behind them—reinforcing the study’s emphasis on structural rather than short-term disruptions.

3. Results

Before analyzing the relationship between income class and pro-environmental behavior (PEB), it is essential to determine whether the three PEB variables reflect a single underlying construct or represent distinct behaviors. A Cronbach's alpha test produced a value of 0.1702, well below the commonly accepted threshold of 0.5 for internal consistency. This low alpha indicates that the three indicators are weakly correlated and should be treated as separate measures rather than combined into a single index. Consequently, this study adopts a different methodological approach from Purba and Kusumawardani [12], who also used the 2021 SPTK data but applied Categorical Principal Component Analysis to construct a composite PEB index based on ten environmentally friendly behaviors, including the three examined in this study.

This study utilizes a multilevel mixed-effects logistic model to estimate individuals' likelihood of engaging in PEB, accounting for the hierarchical structure of the data. Table 1 presents the model estimates, where odd-numbered models ((1), (3), and (5)) examine the determinants of PEB, including income class, provincial-level contextual variables (Human Development Index, HDI), and individual and household characteristics. The even-numbered models ((2), (4), and (6)) incorporate interaction terms between income class and HDI to assess moderating effects. In these interaction models, HDI is mean-centered to reduce multicollinearity and improve interpretability, ensuring that the main effects are evaluated at average provincial conditions.

Table 1. Multilevel Mixed-Effects Logistic Model Estimates

	Turn off water tap when not in use		Turn off lights when not in use		Sort wet and dry waste	
	(1)	(2)	(3)	(3)	(5)	(6)
Female	1.160*** (0.028)	1.160*** (0.028)	1.188*** (0.042)	1.188*** (0.042)	1.384*** (0.027)	1.383*** (0.027)
Age	1.014*** (0.001)	1.014*** (0.001)	1.014*** (0.002)	1.014*** (0.002)	1.006*** (0.001)	1.006*** (0.001)
Married	1.043 (0.033)	1.042 (0.033)	1.214*** (0.056)	1.217*** (0.056)	1.302*** (0.035)	1.306*** (0.035)
Primary	1.477*** (0.045)	1.477*** (0.045)	1.322*** (0.064)	1.323*** (0.064)	1.374*** (0.042)	1.371*** (0.042)
Junior Secondary	1.815*** (0.069)	1.814*** (0.069)	1.466*** (0.086)	1.468*** (0.086)	1.636*** (0.057)	1.632*** (0.057)
Senior Secondary	2.189*** (0.085)	2.189*** (0.085)	1.596*** (0.091)	1.599*** (0.092)	1.813*** (0.061)	1.810*** (0.061)
Tertiary	2.790*** (0.165)	2.795*** (0.166)	1.792*** (0.140)	1.802*** (0.141)	2.338*** (0.096)	2.338*** (0.096)
Urban	2.070*** (0.059)	2.069*** (0.059)	1.030 (0.042)	1.029 (0.042)	0.998 (0.021)	0.997 (0.021)
Length of stay	0.995*** (0.001)	0.995*** (0.001)	0.999 (0.001)	0.999 (0.001)	0.999* (0.001)	0.999 (0.001)
Income Class						
Lower-middle	1.134*** (0.032)	1.135*** (0.033)	1.177*** (0.052)	1.183*** (0.055)	0.912*** (0.023)	0.907*** (0.023)
Upper-middle	1.256*** (0.043)	1.289*** (0.046)	1.144*** (0.059)	1.137** (0.060)	0.914*** (0.026)	0.910*** (0.026)
High	1.571*** (0.063)	1.557*** (0.065)	1.081 (0.060)	1.060 (0.060)	1.017 (0.030)	1.014 (0.030)
Human Development Index	1.096*** (0.020)	1.092*** (0.021)	1.044** (0.019)	1.048** (0.020)	0.986 (0.014)	1.000 (0.015)
Income Class*HDI						
Lower-middle*HDI	-	0.999 (0.008)	-	1.008 (0.010)	-	1.002 (0.007)
Upper-middle*HDI	-	1.025*** (0.009)	-	0.998 (0.011)	-	0.976*** (0.008)
High*HDI	-	0.993 (0.009)	-	0.980* (0.011)	-	0.968*** (0.007)
κ	6.023 (1.335)	-0.505 (0.100)	1.395 (1.309)	-1.700 (0.125)	1.376 (1.026)	2.357 (0.083)
Variances: Province (constant)	0.166 (0.043)	0.166 (0.043)	0.157 (0.042)	0.155 (0.041)	0.101 (0.025)	0.100 (0.025)
Wald-Income Class (p-value)	0.000	0.000	0.002	0.002	0.000	0.000
Wald-Interaction (p-value)	-	0.006	-	0.109	-	0.000
Intraclass Correlation	0.048	0.048	0.046	0.045	0.030	0.029
LR-test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Observations	74,684	74,684	74,684	74,684	74,684	74,684

Standard Errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The appropriateness of the multilevel approach is supported by the Intraclass Correlation Coefficient (ICC) in Table 1, column (1), which indicates that provincial differences account for 4.8% of the variance in water conservation behavior, while individual-level factors explain the remaining 95.2% [18]. Additionally, a likelihood ratio (LR) test yields a p-value of 0.000, confirming significant differences in estimation accuracy between the multilevel and conventional single-level logistic models. This result underscores the appropriateness of the multilevel approach, as it provides more precise estimates and enhances the reliability of the findings. Furthermore, these results contribute to the growing cross-cultural research on environmental behavior by reinforcing the need to simultaneously consider individual and contextual factors in shaping behavior across provinces [20].

Assessing potential multicollinearity among the independent variables is an important step in ensuring the robustness of the analysis. This was addressed using the Variance Inflation Factor (VIF), which quantifies the extent of correlation among predictors. The results showed a maximum VIF value of 2.26, well below the conventional threshold of 10, indicating that multicollinearity is not a concern in this study. This confirms that the independent variables are sufficiently distinct, supporting stable coefficient estimates and reliable statistical inference.

3.1. Impact of Income Class on the Likelihood of Engaging in PEB

The results underscore the significant impact of income class on pro-environmental behaviors (PEBs), though the effects vary across behavioral domains. For water conservation, such as turning off taps when not in use, the likelihood of engagement increases steadily with income. Compared to the low-income group, individuals in the lower-middle-income group have 13.4% higher odds of engaging in this behavior, rising to 25.6% for the upper-middle-income group and 57.1% for the high-income group. This trend suggests that higher-income individuals may be more proactive in conserving water due to greater environmental awareness, better access to water-efficient technologies, and fewer financial constraints.

In contrast, energy conservation behaviors—such as turning off lights—exhibit a more nuanced relationship with income. The lower-middle-income group shows 17.7% higher odds of engaging in this behavior than the low-income group. However, the effect weakens slightly for the upper-middle group (14.4%) and becomes statistically insignificant for the high-income group. This pattern may reflect greater cost sensitivity among middle-income households, while higher-income households with more financial flexibility may be less inclined to adopt small-scale energy-saving habits.

For waste management, particularly the separation of wet and dry waste, income class is negatively associated with engagement. Individuals in the lower-middle- and upper-middle-income groups are 8.8% and 8.6% less likely, respectively, to sort waste than those in the low-income group, while no significant difference is observed for the high-income group. This suggests that wealthier individuals depend more on formal waste collection systems. In contrast, lower-income households, especially those in areas with limited public services, may sort waste out of necessity—such as to sell recyclables.

These findings align with and help contextualize international evidence on income-related differences in environmental behavior. For example, a study in Malaysia found that higher income supports water conservation [21], whereas research in Spain indicated the opposite trend [22]. In China, income was found to have no significant effect on energy conservation [23], and wealthier households were less involved in waste sorting, relying more heavily on formal systems [24]. These mixed results highlight the need for context-specific analysis when interpreting the role of income in shaping PEB.

In Indonesia, Purba and Kusumawardani [12] reported that higher-income individuals expressed lower environmental concern when measured through a composite PEB index. However, by disaggregating behaviors, this study reveals a more nuanced picture: Income class does not increase or decrease PEB uniformly but shapes different behaviors differently. This emphasizes the importance of analyzing environmental actions separately rather than assuming a single pattern of engagement across domains.

These results directly address Research Question 1—How does income class influence PEB adoption?—by demonstrating that income class significantly shapes engagement, though in behavior-

specific ways. This underscores the need for targeted, domain-specific policy interventions that address socioeconomic disparities to promote sustainability across all income groups.

3.2. *The Role of Human Development in Shaping PEB*

The results reveal a nuanced relationship between the Human Development Index (HDI) and pro-environmental behavior (PEB), illustrating how broader provincial-level economic conditions influence individual environmental actions. In provinces with higher HDI scores, individuals are 9.6% more likely to engage in water conservation and 4.4% more likely to adopt energy-saving behaviors with each unit increase in HDI. These findings suggest that higher levels of development—reflected in better education, greater environmental awareness, and improved access to infrastructure—create enabling conditions for sustainable practices. However, no significant association is found between HDI and waste management behaviors, such as sorting wet and dry waste. This suggests that such behaviors may be less influenced by regional development levels and more dependent on structural and policy-related factors, including local regulations, access to waste services, and targeted public awareness initiatives.

The findings demonstrate that regional macroeconomic conditions significantly influence engagement in PEB, directly addressing Research Question 2—How do regional macroeconomic factors influence engagement in PEB? These results underscore the need for sustainability policies considering economic disparities across regions. Supporting this, a study of European Union countries found that greater affluence tends to encourage PEB, while higher income inequality has a dampening effect [25]. Similarly, research in OECD countries provides strong evidence that higher HDI levels promote environmental sustainability, although the impact on PEB is often indirect—mediated through education, infrastructure, and economic incentives [26]. By showing how HDI shapes individual environmental behavior, this study reinforces the importance of regionally targeted policies that address uneven levels of human development and foster pro-environmental attitudes.

3.3. *Moderating Effects of Human Development on the Relationship Between Income Class and PEB*

The Human Development Index (HDI) significantly moderates the relationship between income class and pro-environmental behavior (PEB), though its effects vary by behavior type and income group. While higher HDI levels generally support greater sustainability, the magnitude and direction of this influence differ across practices. For instance, in provinces with higher HDI, individuals in the upper-middle-income group are 2.5% more likely to engage in water-saving actions, such as turning off taps when not in use. This suggests that greater access to education, information, and environmental awareness in more developed regions can enhance specific conservation efforts among certain income segments.

In contrast, the moderating effect of HDI on energy conservation—measured by the practice of turning off lights—is minimal. The Wald test fails to reject the joint null hypothesis that all interaction terms between income class and HDI are equal to zero ($p = 0.109$), indicating no significant variation across income groups. This suggests that energy-saving behaviors are more universally practiced, likely driven by widespread cost-consciousness, ingrained habits, and shared social norms rather than by differences in income or regional development. In this case, turning off lights appears to be a routine behavior adopted broadly across society.

Waste management reveals an unexpected pattern. As HDI increases, individuals in the upper-middle and high-income groups are less likely to sort waste. This decline in direct involvement may stem from greater reliance on formal waste collection and management services in more developed areas, which reduces the need for personal sorting. In contrast, lower-middle-income individuals show no significant change in waste-sorting behavior, suggesting that necessity rather than development level may be the primary driver for their engagement.

These findings support the argument that national wealth and social structures influence environmental behavior while highlighting the limitations of assuming uniform effects [27]. HDI does play a moderating role, but its influence is selective, promoting water conservation among the upper-middle class, having no significant impact on energy-saving or transportation behavior, and even

discouraging waste sorting among the affluent. By revealing these complex patterns, the analysis answers Research Question 3—How do regional economic conditions shape income-based disparities in PEB engagement?—and underscores the need for context-sensitive policy approaches that reflect behavioral and socioeconomic differences.

3.4. Brief Discussion on Individual and Household Factors Influencing PEB

The estimation results reveal a complex set of individual and household factors that shape participation in pro-environmental behavior (PEB). Gender and age are consistent predictors, with women and older individuals more likely to engage in environmentally responsible actions. This may reflect gendered roles in household management and greater environmental concern among older generations. Marital status, however, shows varied effects depending on the behavior examined. Being married does not significantly influence the likelihood of turning off taps when not in use, but is associated with a higher probability of turning off lights and sorting wet and dry waste. These patterns suggest that shared household routines and responsibilities with others more influence certain PEBs.

Education and residential context further contribute to variations in PEB. Individuals with at least primary education are more likely to engage in sustainable practices, with the likelihood increasing alongside higher educational attainment, pointing to the role of environmental awareness and knowledge. Urban residents are more inclined to practice water conservation, such as turning off taps, possibly due to higher exposure to environmental campaigns or resource constraints. Interestingly, longer tenure in a community is linked to lower participation in water conservation and waste sorting, which may indicate declining responsiveness to environmental initiatives over time. These findings underscore the need to tailor environmental policies to specific demographic and social contexts, as different behaviors are shaped by varying individual and household factors.

4. Discussions

4.1. Income Class and Capital Differentiation in Sustainability

This study challenges the assumption that higher income universally leads to greater environmental responsibility [28]. While wealthier individuals tend to engage in water conservation, middle-income groups are more active in energy-saving practices, yet participate less in waste sorting than lower-income individuals. These variations suggest that sustainable behaviors are not solely determined by financial capacity but are influenced by class-based routines, cultural norms, and structural limitations.

These patterns can be interpreted through Bourdieu's [29] framework of capital differentiation—economic, cultural, and social. Economic capital enables affluent individuals to invest in sustainable technologies, making it easier to adopt low-effort conservation actions. Cultural capital, shaped by education and socialization [30], influences behaviors viewed as legitimate or desirable. Social capital, in turn, reinforces these patterns through shared norms within peer networks. This interpretation aligns with the view that structural and psychological factors influence sustainability-related behaviors [31].

In addition to theoretical insights, practical constraints—such as affordability, infrastructure, and social context—shape sustainable practices. Wealthier individuals can afford energy-efficient technologies, while lower-income groups prioritize immediate needs, often limiting their engagement in cost-intensive behaviors [32]. Infrastructure disparities further constrain participation; for instance, limited waste management services in poorer communities reduce opportunities for recycling [33].

Social incentives also play a critical role. Higher-income individuals are often embedded in social networks that promote sustainability, encouraging adoption through peer influence. Conversely, those in lower-income settings may experience different social pressures or lack exposure to environmental norms. Thus, effective policy must go beyond economic and infrastructural solutions to address cultural and community dynamics, embedding sustainability in everyday practices [34].

4.2. Regional Disparities in Everyday Sustainability Practices

The findings also highlight pronounced regional differences in sustainability practices, shaped by disparities in human development. In high-HDI regions, individuals are more likely to conserve water and energy, supported by better infrastructure and heightened environmental awareness. In contrast, conservation in low-HDI regions is often driven by necessity, as water scarcity and financial hardship compel resource-saving behaviors. However, inadequate infrastructure frequently reduces the effectiveness of these efforts.

Interestingly, waste management behaviors appear less directly linked to HDI levels. Instead, they are more responsive to institutional conditions, such as the presence of local government programs and service availability. This underscores the importance of policy design and infrastructure provision in shaping environmental practices beyond economic capacity.

The interaction between income class and regional development further complicates the sustainability landscape. In high-HDI areas, upper-middle-income individuals are more likely to conserve water due to a combination of educational advantages and access to reliable infrastructure. Meanwhile, lower-middle-income residents in the same regions may still face financial constraints that limit engagement. Waste management similarly reflects economic and structural factors: wealthier groups in high-HDI areas are more likely to rely on formal waste services, highlighting the importance of affordability and accessibility. A review of 31 studies indicates that although economic growth can initially put pressure on the environment, improvements in education and income levels tend to promote better conservation practices, highlighting human development as a crucial driver of long-term sustainability [35].

5. Conclusions

5.1. Summary of Findings

This study offers valuable insights into how income class and regional economic development interact to influence pro-environmental behavior (PEB). Addressing Research Question 1—How does income class influence PEB adoption?—the findings indicate that higher-income individuals are more likely to practice water conservation, likely due to better access to infrastructure and technologies. Interestingly, lower-middle and upper-middle-income groups show higher engagement in energy conservation but participate in waste sorting less frequently than low-income individuals. These divergent patterns suggest that financial resources alone do not determine environmental behavior. Instead, class-based norms, social expectations, and habitual routines also shape individuals' sustainability practices. In this context, lower-income households may adopt certain behaviors like waste sorting due to necessity or community-level norms, while middle- and upper-income groups may prioritize different forms of conservation that are more aligned with their lifestyles and material capacities.

Concerning Research Question 2—How do regional macroeconomic factors influence engagement in PEB?—the analysis shows that individuals living in provinces with higher Human Development Index (HDI) scores are more likely to engage in water and energy conservation. However, the impact of regional HDI on waste sorting is statistically insignificant, indicating that some behaviors are more sensitive to macroeconomic contexts than others.

In exploring Research Question 3—How do regional economic conditions shape income-based disparities in PEB?—the results reveal that HDI interacts differently across behaviors and income groups. While higher HDI enhances water conservation, particularly among upper-middle-income individuals, it is associated with a slight decline in energy conservation among the wealthiest group. Notably, in wealthier provinces, high-income individuals appear less directly involved in waste sorting, possibly due to increased reliance on paid services or systemic outsourcing. These findings underscore the complex and behavior-specific ways macroeconomic development can facilitate and displace forms of environmental responsibility depending on social class.

5.2. Policy Implications

Indonesia's 2025–2045 development plan prioritizes sustainable growth, and this study offers policy recommendations to support inclusive pro-environmental behavior (PEB). Sustainability must be embedded within broader economic and social policies to ensure adoption across income groups. Infrastructure expansion in low-HDI regions is essential, where conservation is often driven by necessity. Improving access to clean water and energy-efficient technologies can help reduce structural barriers to sustainability. Policies should ensure that sustainability is not exclusive to affluent areas but accessible to all communities.

Financial incentives are crucial to promoting sustainable choices. Targeted subsidies or tax breaks for energy-efficient appliances can boost adoption among low- and middle-income households. Tiered energy pricing and efficiency rebates can also reduce the cost burden on poorer households. Supporting informal recycling markets and community-based waste management initiatives can further encourage participation in waste sorting through economic incentives.

Waste management policies should ensure reliable services in high-HDI areas and create local economic opportunities in lower-income regions. As formal systems improve, behavioral incentives such as deposit-return schemes or pay-as-you-throw programs should promote individual responsibility.

Environmental education is vital for lasting change. Awareness campaigns must be tailored to different socioeconomic groups, highlighting environmental and financial benefits. A uniform approach is unlikely to succeed; policies must consider regional disparities and class-based constraints. In wealthier regions, campaigns should emphasize ongoing personal responsibility, while in poorer areas, they should highlight immediate gains. By aligning sustainability with economic realities, Indonesia can build inclusive environmental policies that foster meaningful and lasting behavioral change across society.

5.3. Study Limitations and Future Extension

This study offers a comprehensive analysis of the determinants of PEB but is limited by its reliance on a single-year dataset. This constraint reduces its ability to capture long-term behavioral patterns. Expanding the dataset to cover multiple years through ongoing SPTK surveys or other sources would provide deeper insights into how PEB evolves. A longitudinal approach could help distinguish between persistent trends and temporary shifts, offering more substantial evidence of environmental behavior's structural and contextual drivers.

Another limitation is the dataset's focus on observed behaviors without examining the underlying motivations. Understanding the psychological drivers of PEB, as outlined in the Value-Belief-Norm framework [36] and the Theory of Planned Behavior [37], is crucial for developing effective policies. Interventions that address underlying motivations rather than just observable behaviors can promote more meaningful and sustained environmental engagement. Future research should incorporate data on environmental attitudes, perceived norms, and personal values to better capture how economic conditions influence sustainability practices.

A broader definition of PEB is also necessary to reflect the full spectrum of sustainable actions. Current measures may overlook critical behavioral nuances related to energy use and waste management. Incorporating qualitative insights—such as accessibility perceptions, cultural influences, and social pressures—would provide a more holistic understanding of the barriers and facilitators of PEB. A context-specific approach will enhance the foundation for targeted, effective sustainability interventions across different income groups and regions.

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