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Preservation and utilization dialogue in Indonesia's future capital city

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ABSTRACT

Environmental sustainability has become crucial, especially in tropical environments that act as lungs for the world. Therefore, exploring the pro-environmental behavior (PEB) of young citizens of Eastern Borneo in Indonesia is beneficial. Exploration focused on the PEB category of students, the PEB aspect (preservation, utilization, appreciation), and student responses to the local environmental issues. This study surveyed 651 9th-grade students (15-year-olds) in six cities around Eastern Borneo. The measurement of PEB was carried out using the adapted two major environmental values model with an added scale for appreciation. Additional open-ended questions were applied to clarify the students' perspectives on the significant environmental issues in Eastern Borneo. The result showed that only half of the students (51.31%) had advanced PEB, with the rest classified as transitional (48.23%) and naive (0.46%). Among the three PEB aspects, utilization scored the highest, indicating that the students were strongly inclined to endorse the importance of environmental utilization for human welfare. Moreover, the majority favored relocating the capital city, which highlights the importance of a new capital city owing to the overcrowded state of the current capital city (Jakarta) and the decentralization of the development of Indonesia. Nevertheless, it was found that they are concerned about preservation and sustainability regarding coal mining and palm plantations. Therefore, it was considered that environmental education for students needs enhancement to shape their PEB with contextual environmental issues.

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1. INTRODUCTION

Shaping the young generation's understanding of issues related to environmental sustainability is an ongoing priority because this generation will be the environmental decision-makers in the near future [1], [2]. It is, therefore, urgent to enhance environmental education to help children become eco-citizens [3]. In particular, junior high school is a foundational stage of children's development that influences their future career aspirations [4]. Although the enhancement of environmental education in this phase is crucial, the level of environmental understanding remains unclear.

Although global environmental issues have been identified, such as those mentioned in the sustainable development goals [5], there are complex issues related to specific locations, such as tropical countries [6]. For Indonesians, several environmental problems, such as the degradation of forest areas, forest fires [7], climate change [8], the relocation of the Indonesian capital city to Borneo Island [9], and

deteriorating water quality [10], are a part of children's daily lives. While the Indonesian government and non-governmental organizations have conducted various efforts to address environmental problems [11], changes in human behavior toward the environment are rarely explored.

The relocation of the Indonesian capital city from Java to Borneo increases concern about environmental damage in Borneo, which is considered a biodiversity hotspot in Southeast Asia [12]. This relocation represents an example of systematic transmigration involving massive land clearing associated with climate change and may lead to a significant biodiversity catastrophe [9]. In contrast with infrastructure development, concern about human aspects is still insufficient. The capital city relocation needs to consider the citizens and environmental aspects [13]. Therefore, an investigation of the human behavior toward this issue in Borneo is urgently needed as an initial description for creating an environmental education program.

Human behavior that consciously protects the environment and improves sustainability is called pro-environmental behavior (PEB) [14]. Previous researchers have investigated the PEB level of young generations in several countries, such as China, Malaysia, Dutch, and Tanzania [15]–[18]. In the case of Indonesia, understanding the country's situation requires appreciating the need for equality in the non-Java island context [19]. Therefore, additional questions related to vital environmental issues need to be incorporated in questionnaires aiming to measure PEB related to contextual environmental problems in Indonesia. This study emphasizes the essential aspects of PEB, which are preservation (P), utilization (U), and appreciation (A), through closed-ended items and open-ended items related to contextual environmental issues, such as the relocation of the Indonesian capital city to Eastern Borneo, coal mining, and palm plantations. Our research aims to explore Eastern Bornean junior high school students' PEB because this is one of the critical components of the sustainability of the location that leads to the sustainability of the new capital city. The findings of this study can support science teachers, curriculum developers, and policymakers in strengthening PEB. Moreover, the findings hope to enhance students' PEB further in Indonesia and other countries worldwide, mainly tropical countries. The following research questions guided the analysis and coding of our search:

- What is the status of Eastern Bornean students' PEB?
- For each aspect of PEB, which aspect is dominant?
- How do students respond to environmental issues in Eastern Borneo and their implications for future environmental education?

2. METHOD

This study is a cross-sectional survey based on quantitative and qualitative data [20]. Since the study was carried out on a large scale, quantitative data provided a broad overview of students' views of PEB across Eastern Borneo. Follow-up with qualitative data helped us to clarify patterns in their views on PEB based on the orientation of students' responses toward the appreciation of nature, preservation, and utilization. Student responses were interpreted through the overall score, each aspect, and response categorization. This research was conducted after the ethical committee's approval, and all participants confirmed their consent to participate in this study.

2.1. Indonesia's high school as a study context

Indonesia, an archipelagic country in Southeast Asia, is now known as the fourth most populous country worldwide. This is one of the reasons why the environmental situation in Indonesia has a global impact. The National Vision of Indonesia in 2045 is stated as *berdaulat*, *maju*, *adil*, *dan makmur*, which translates to independence, progressiveness, equity, and prosperity. This vision is reflected in the education sector's aim to educate students in critical thinking, creativity, independence, collaboration, and global inclusivity. Recently, Indonesia developed a new science curriculum framework as part of the new national curriculum after the pandemic. The revised science curriculum emphasizes a balance between understanding science and the scientific process that aligns with human civilization's challenges [21]. The curriculum framework organizes science learning in junior high schools as an integrated science subject. PEB in Indonesia is not explicitly mentioned but incorporated in the integrated science subject, especially in working scientifically on global warming. The science curriculum aims to help students explore Indonesia's natural resources, identify environmental problems, and solve local and global problems. From a science perspective, natural sustainability has become a vital concept of the science curriculum [22].

2.2. Population and sampling

In this study, the population consisted of 9th-grade students in junior high school in East Kalimantan province, which in this study is referred to as Eastern Borneo. The total student population in 9th grade in these 10 cities and regencies is about 26,000. To determine the sample size, Yamane [23] table and formula

were used. This produced a sample size of 379 out of a population of 26,000 at a 95% confidence level, which is acceptable in educational research. A stratified random sampling method was used to find a representative population sample. Eastern Borneo is divided into regions categorized as cities and regencies due to its location. Each region was considered a stratum. Schools were randomly sampled from each stratum depending on the number of students in the regions. A section of 9th-grade students from each school was randomly selected to participate in this study. Schools were selected to be as representative as possible, but this was dependent on the willingness of the school principals, teachers, and students to be involved. In total, 14 junior high schools and 651 students participated in this study, as shown in Table 1.

Table 1. Number of participants and schools by city or region

City/region	Number of schools	Number of participants
Samarinda	3	137
Kutai Kartanegara	3	117
Berau	3	177
PPU-Paser	3	119
Balikpapan	2	101

2.3. Data collection

The existing PEB instrument [17], [24] was adapted to assess 9th-grade Eastern Bornean students' views of PEB. The closed-ended instrument consists of 7 items for each aspect (preservation, appreciation, utilization), which are responded to using a 5-point Likert scale. The initial instrument was written in English, and one of the authors translated it into Indonesian. Moreover, discussions among authors were conducted to check the translation. Because the subject of this research is 9th-grade students, we did a small-scale trial with 10 students from 9th grade to receive opinions about the legibility of the instrument. Three more open-ended questions were added to explore PEB more deeply in relation to some environmental issues in Eastern Borneo. These questions were related to palm plantations, coal mining, and the relocation of Indonesia's capital city to Eastern Borneo. These topics were chosen as the most relevant contextual issues for the students after focus group discussions among researchers, environmentalists who are experts on Borneo issues, and science teachers. The responses to these three open-ended questions were coded, as shown in Table 2. P, U, and A represent the appearance of preservation, utilization, and appreciation in answers containing only one aspect of PEB. Additionally, PU would stand for preservation and utilization, PA for preservation and appreciation, or UA for utilization and appreciation, respectively, when two aspects were present in an answer at once. Answers that did not relate to any PEB aspect were categorized as uncategorized.

Table 2. Open-ended questions related to Eastern Borneo environmental issues

Question	Category of response	Coding by PEB aspect
Indonesia's capital city is Jakarta, which is considered too crowded for further development. The idea of relocating the capital city to Eastern Borneo, with a total area of approximately 256,142 hectares, was proposed in Indonesian Law No 3 in 2022. Do you agree to the relocation plan even though it would affect the environment? Please explain why.	Yes/no/uncertain/ no answer	P/U/A/PU/PA/UA/ uncategorized
Coal mining has been an occupation for many people in Eastern Borneo for years. However, mining also has negative impacts on the environment. Do you agree with coal mining activities? Please explain why.	Yes/no/uncertain/ no answer	P/U/A/PU/PA/UA/ uncategorized
Palm plantations are typical in Eastern Borneo. However, it is well known that they are one of the causes of the habitat reduction of orangutans. Do you agree with the palm plantations around you? Please explain why.	Yes/no/uncertain/ no answer	P/U/A/PU/PA/UA/ uncategorized

2.4. Data analysis

The data collected were analyzed using both qualitative and quantitative measures. The scoring rubric was adapted from the one created and validated by Bissinger and Bogner [25]. The rubric contained positive and negative responses. The positive (+) ones represented the responses consistent with the appreciation and preservation of nature, and the negative (−) ones represented students' views of utilization. For each positive response, points were given from 1 to 5 as: strongly disagree=1, disagree=2, uncertain=3, agree=4, and strongly agree=5. Similarly, the scores were assigned in reverse order for each negative response on a scale from 5 to 1 as: strongly disagree=5, disagree=4, uncertain=3, agree=2, and strongly agree=1. The PEB score was then calculated from the three aspects and assigned to one of three categories adapted from previous studies [26]. These categories and their ranges are shown in Table 3. For the open-

ended items, the keywords that students used to explain their responses were coded into three aspects of PEB. This categorization is shown in Table 4.

For the open-ended items, the students were asked questions about Eastern Borneo's utilization phenomena. They were asked to agree or disagree and explain their answer. If they agreed, they were assigned to the utilization category. Their explanation was further analyzed if they disagreed with the provided phenomena to determine whether it reflected appreciation or preservation. Keywords appearing in the explanation, such as "enjoy" for appreciation and "protect" for preservation, aided this process. If students did not respond to specific questions or if their responses did not answer the questions, these responses were classified as uncategorized. To ensure the reliability of the data analysis, the first author analyzed all the data independently, and the second and third authors reviewed all the analyzed data. Differences in interpretation were resolved through further discussions until a consensus was reached.

Table 3. Categories for closed-ended items

Category	Description	Range
Naive	Most responses show weak support for PEB	1.00≤X<1.33
Transitional	Most responses are neutral regarding PEB	1.33≤X<3.66
Advanced	Most responses are highly positive toward PEB	3.66≤X≤5

Table 4. Scoring guide for open-ended responses

Issues	Keywords related to PEB aspects		
	Preservation	Utilization	Appreciation
1. Indonesia's capital city relocation	Disagree	Agree	Disagree
2. Coal mining	Take care of nature	It is needed for human life	Destroy the beauty of nature
3. Palm plantations			

3. RESULTS AND DISCUSSION

3.1. Results

This section presents our analyses of the students' responses to closed-ended and open-ended questions that explored their PEB. In total, 651 junior high school students in 9th grade completed the online PEB questionnaire.

3.1.1. Eastern Bornean students' PEB

The students' responses to the closed-ended questions were categorized as shown in Figure 1, which provides an overview of the students' levels of PEB. The study findings revealed that half of the participants were in the advanced category. Moreover, 48.23% and 0.46% of responses were in the transitional and naive categories, respectively. Among all the closed-ended question items, item U1 was the only item categorized into the naive category. Item U1 stated, "We must build roads to facilitate transportation to remote areas." Most students strongly agree that roads must be built to facilitate transportation.

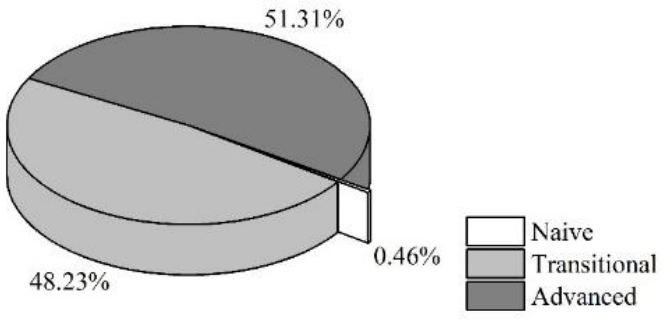

Figure 1. Overview of Eastern Bornean students' PEB

3.1.2. Aspects of PEB

The first part of the questionnaire was the closed-ended items covering the three aspects of preservation, utilization, and appreciation. The results of the descriptive analysis showed that utilization scored the highest overall, at an average of 3.36 out of a maximum score of 5, as seen in Figure 2. This result

indicates that the students strongly endorsed the importance of environmental utilization for human beings' welfare. The result was 2.30 and 2.16 for the preservation and appreciation aspects, respectively. Therefore, the aspect with the lowest result was the appreciation of nature. For example, for item A2, out of 651 total responses, 369 (56%) disagreed and scored 1.

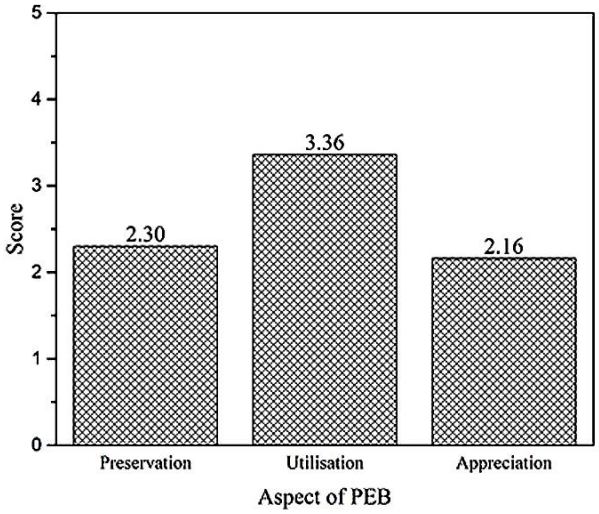

Figure 2. Total average scores for students' responses by the aspect of PEB

3.1.3. Response to environmental issues in Eastern Borneo

To explore students' PEB more deeply, additional open-ended questions related to the main environmental issues in Eastern Borneo were included in the questionnaire. Figure 3 presents the overall distribution of students' responses to these issues, illustrating both general attitudes and their underlying environmental considerations. The majority of the students (62.5%) agreed with the plan for Indonesia's capital city relocation, 29.8% disagreed, 3.8% were uncertain, and 3.8% had no opinion, as in Figure 3(a). The students prioritized the relocation of the capital over the preservation of forestland. In contrast to the relocation issue, 47% and 48% of participants disagreed with coal mining and palm plantation activities, respectively, as in Figure 3(b). The majority of the participants disapproved of these activities despite the fact that they are a part of their daily lives.

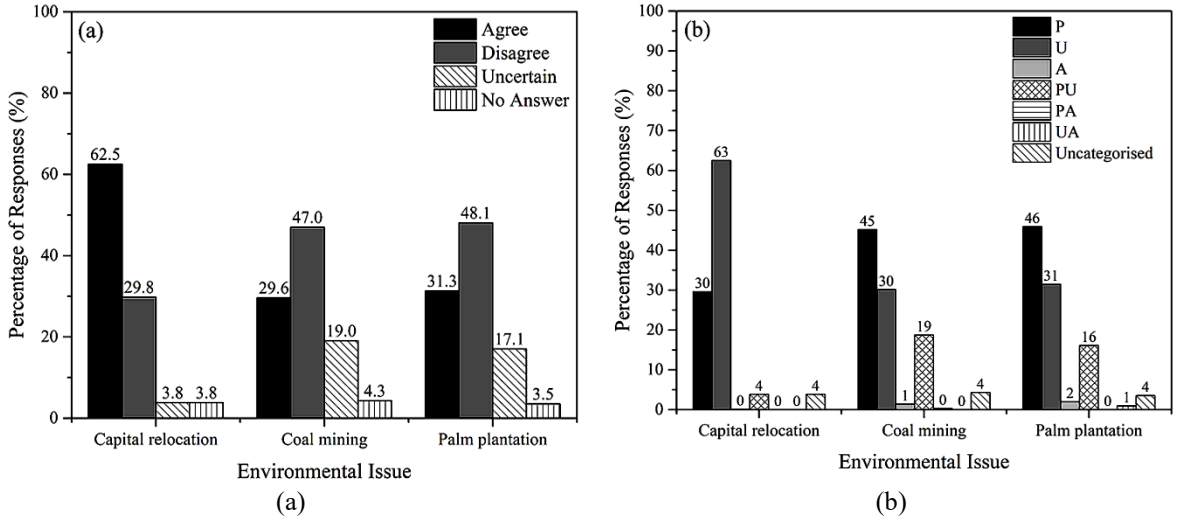

Figure 3. Overall distribution of students' responses: (a) regarding environmental issues in Eastern Borneo and (b) responses categorized by PEB aspects

3.2. Discussion

This investigation provides a much-needed step toward understanding PEB in Eastern Borneo province, Indonesia, well-known for its tropical forests, coal mining, and palm plantations. Previous investigations focused on developing instruments for measuring PEB [24], [27] or exploring PEB instruments based on theory. Our results provide a balanced perspective using the 2MEV with the appreciation of the nature aspect added and an exploration of contextual environmental issues for Eastern Bornean. We found that only about half of junior high school students in Eastern Borneo had PEB scores falling into the advanced category. Of the three aspects of PEB (appreciation, utilization, and preservation), the utilization aspect received the highest score. We provided some examples of selected environmental issues in Eastern Borneo and asked the students for their opinions. The results showed that the students were concerned about the preservation aspect concerning coal mining and palm plantations, but they were more concerned about the utilization aspect in terms of the relocation of Indonesia's capital city.

3.2.1. From naive to advanced

As environmental problems are usually due to human behavior, the solution to any environmental issue requires changes in human behavior. Strengthening PEB from the naive to the advanced level to support environmental sustainability is crucial. It is essential for the youth to understand natural interrelationships and concepts to become informed decision-makers and active participants in a sustainable society [28]. An advanced level of PEB would have been reflected in students choosing the responses scoring 4 or 5 for the preservation and appreciation aspects, while choosing the responses scoring 1 or 2 for the utilization aspect. In contrast to this idealization of students' PEB, students favor the utilization of nature. This indicates that natural sustainability is not fully implemented in the science curriculum [22].

According to the theory of planned behavior [29], advanced PEB results from a positive attitude to the environment, personal norms regarding the environment, and behavior control in relation to the environment from society. Attitude to the environment is related to environmental and ecological knowledge [30]. Previous studies have shown that a more extended and better quality environmental education supports more extensive knowledge about environmental issues [31]. In reality, the causal relationship between knowledge and behavior is rarely established, and increases in knowledge can often not translate into behavioral changes [32]. Individuals armed with knowledge may still be unmotivated to participate in PEB, which is a possible cause of this problem [33]. Given this finding, education to enhance PEB is best carried out by emphasizing motivational factors and benefits that promote PEB, especially for young citizens.

In addition, it is vital to identify and remove barriers to behavioral changes. Based on the study result, only item U1 was categorized as naive. Most students believe that highway construction is more important than forest or land preservation since there is a lack of road infrastructure in remote areas of Kalimantan. This poor infrastructure can be considered a barrier to PEB changing to an advanced level, as it reduces the probability of students engaging in PEB. Our finding is also in line with the previous research in India, which exhibited that the community that lives in an area with inadequate infrastructure tends to have lower PEB [34]. In order to make environmental education effective in enhancing the PEB of Eastern Bornean students, the barriers (as in the case of lacking road infrastructure) need to be decreased.

The aspect of social control is also crucial in promoting PEB. In Indonesia's national development story, "the environment" rarely appears as a topic. In the discourse of national progress, the environment is only mentioned for its wealth of natural resources, and it is Indonesia's prerogative to exploit fully to create prosperity for its citizens [35]. Fortunately, in planning Indonesia's new capital city, the government stated that sustainability would be a vital foundation of the new capital [36]. Therefore, the relocation of the capital city could drive increased PEB. As a starting point, environmental education for students and adults needs to be enhanced to shape advanced PEB, especially in Eastern Borneo.

3.2.2. The pathways of students' responses to Eastern Bornean environmental issues

Promoting environmental behavior faces various difficulties, particularly in bridging knowledge and positive habits with the environment. Insight into contextual environmental issues is one of the main factors shaping PEB. The schematic provided in Figure 4 reveals the pathways of students' responses to three environmental issues in Eastern Borneo. The majority of the students (63%) agreed with the relocation of the capital city. They explained that a new location was needed for the capital city, that development would occur around Eastern Borneo, and that Jakarta (the former capital city) was overloaded. Students' responses showed the urgency of decentralizing Indonesia's development. For example, participant M-620 stated, "*I agree with the relocation planning because the decision considered sustainability. The relocation to Eastern Borneo will make the development of our country more evenly spread.*" The students who agreed with the planning showed a solid orientation to the utilization aspect of PEB. Those who disagreed expressed a desire to protect nature, which was related to the preservation aspect of PEB.

An example is the following response from F-603, "*I do not see it this way. Borneo Island has natural ecosystems that need to be protected. If the capital city moves to Eastern Borneo, it could negatively affect the environment and all creatures.*" A former study also showed that the aspects of preservation and appreciation tend to have a positive correlation, while utilization is negative [37]. Moreover, just 4% of the students stated that they were aware of the need for utilization but were also concerned about natural preservation and appreciation. A response from F-20 reveals this conflict: "*It is difficult for me to make a decision. Borneo Island could be a developed area and make people's lives easier. However, I am afraid that the endemic flora and fauna will become endangered.*"

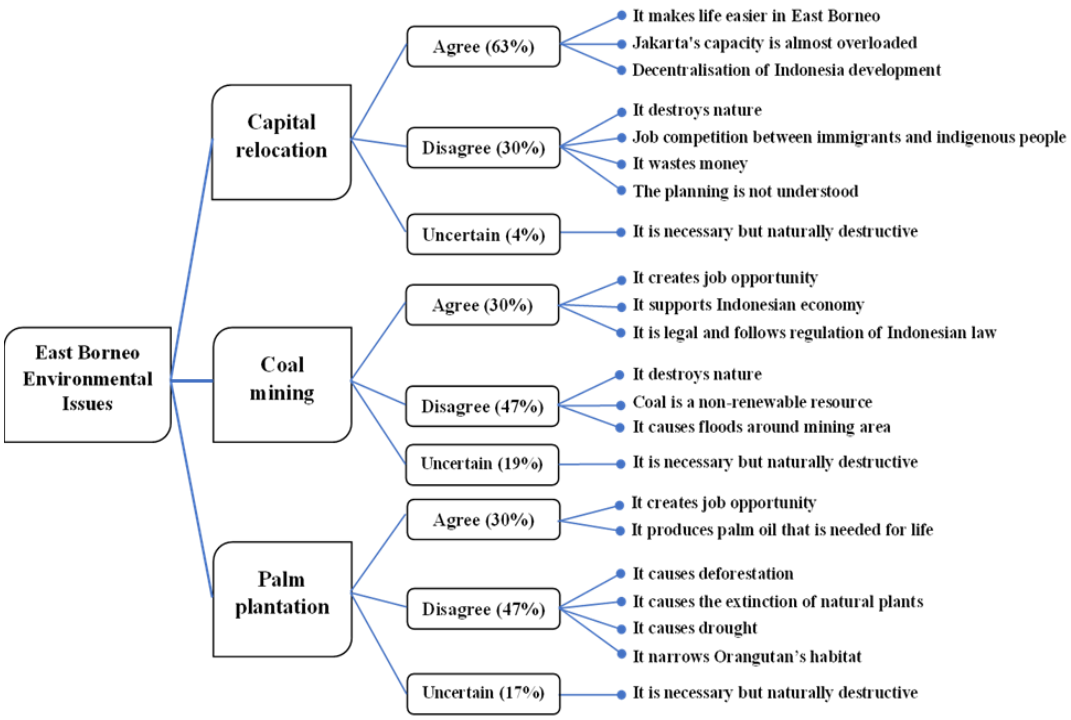

Figure 4. Schematic of the pathways of students' responses

In contrast to the broad agreement on capital city relocation, most students disagreed with coal mining (47%) and palm plantation (47%) activities. This disagreement was mainly related to their concerns about the sustainability of nature. This result is clear in the following responses, "*I think that oil palm plantations are unsustainable since they can destroy forests and pollute the environment*" (F-28), and "*plantations of oil palms are permitted but must not disturb the habitat of orangutans*" (M-204). Living in Eastern Borneo means that the students regularly see coal mining and palm plantations in their immediate environment. Sense of place is a concept that describes the fundamental relationship between people and places [38]. It is based on the assumption that people's sense of place affects their desire to reside in a particular place and their attachment to it, encouraging them to care about its environmental health and strengthening their commitment to protecting it [39]. This aligns with the psychological theory of motivation based on the need to protect nature [40]. Interactions between humans and the environment continuously affect human behavior toward the environment [41]. Students who agreed with palm plantation and coal mining activities mainly valued the profits derived from these activities, and some explained how the adverse effects of these activities could be mitigated. For example, M-125 said, "*In my opinion, coal mining creates job opportunities for the community and improves the country's economy. However, the negative impacts of mining may be mitigated by observing, analyzing, and checking the environment, processing mining waste, and reclaiming the land.*"

Since the relocation of the capital city is ongoing, the students' environmental effects are likely limited compared to their years of experience related to palm plantations and coal mining. Environmental risks such as deforestation and the destruction of orangutans' habitat were frequently mentioned in the responses. This can be attributed to the extensive available information about these negative impacts. For example, it was widely reported that 115 people drowned in post-coal mining pits between 2014 and 2018, and 6.04 million hectares of Borneo Island were cleared for palm plantations, reducing the habitat of

orangutans [42], [43]. Although students are not directly affected by these activities, information about the harm caused by palm plantations and coal mining gained from social media and internet campaigns strengthens their negative opinions of these activities [44].

Despite the efforts to conduct a well-designed cross-sectional survey study, some limitations are also observable. In this study, we examined PEB using a sample of students from Eastern Borneo. The location is well-known for its diversity in ethnicity, both natives and immigrants from other islands of Indonesia. The participating students were not categorized by ethnicity, thus limiting our ability to generalize the results across the different cultural backgrounds. Due to the need to improve positive behavior and the new Indonesian capital city relocation process, a longitudinal research design is a potential for future research. Another limitation is that despite the longitudinal assessment of actual behavior, the remaining factors were measured simultaneously, which prevents causal interpretation. So, future studies that employ qualitative methods and multi-trait measurements might bring more valuable results.

4. CONCLUSION

The investigation focused on the Eastern Bornean students' PEB category, their dominant PEB aspect (preservation, utilization, or appreciation), and their responses to their surrounding environmental issues. The result showed that only half of junior high school students (51.31%) in Eastern Borneo had advanced PEB, with the rest classified as transitional (48.23%) and naive (0.46%). Among the three PEB aspects, utilization scored the highest, indicating that the students were strongly inclined to endorse the importance of environmental utilization for human welfare. Based on the analysis of students' answers regarding common environmental issues in Eastern Borneo, the majority of students favored relocating to the capital city, which highlights the importance of a new capital city owing to the overcrowded state of the current capital city (Jakarta) and the decentralization of the development of Indonesia. Nevertheless, it was found that they are concerned about preservation and sustainability regarding coal mining and palm plantations. Therefore, it was considered that environmental education for students needs enhancement to shape their PEB with contextual environmental issues. Students tended to disagree with coal mining and palm plantations despite these two phenomena being part of their daily lives, mainly due to concerns about the sustainability of nature. These concerns can potentially be traced back to exposure to media campaigns. The results of this study provide helpful information for planning and implementing behavioral interventions in encouraging PEB, especially for students in Eastern Borneo. The interventions should pay more attention to environmental preservation and appreciation aspects.

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AUTHOR CONTRIBUTIONS STATEMENT

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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