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RESEARCH ARTICLE

Adolescent Perceptions of Climate Change on the Outskirts of the Nusantara Capital City

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Abstract: Climate change is a global issue that has a widespread impact on human life. This impact is felt in almost all countries, including Indonesia, which has vulnerable geographical and geological conditions. Among the younger generation affected by climate change, adolescents occupy an important position as a vulnerable group with great potential in facing changing environmental dynamics. Based on this, this study aims to determine how adolescents on the outskirts of the Nusantara Capital City (IKN) perceive climate change. This study uses a qualitative research design. Data were collected using the photovoice technique, in which photographs and adolescents' explanations were analyzed in an integrated manner using thematic analysis. The results of this study indicate that adolescents on the outskirts of the Nusantara Capital City (IKN) have reflective perceptions of climate change, which are formed through direct experience and supported by their cognitive development. Their environmental awareness not only encourages adaptive behavioral changes at the personal level but also provides space for adolescents to express their opinions and propose solutions to environmental problems around them.

Keywords: Adolescent, Climate Change, Environmental Perception, Nusantara Capital City (IKN), Photovoice

Abstrak: Perubahan iklim merupakan masalah global yang memiliki dampak luas terhadap kehidupan manusia. Dampak ini dirasakan di hampir semua negara, termasuk Indonesia yang memiliki kondisi geografis dan geologis yang rentan. Di antara generasi muda yang terdampak perubahan iklim, remaja menempati posisi penting sebagai kelompok yang rentan namun memiliki potensi besar dalam menghadapi dinamika lingkungan yang berubah. Berdasarkan hal tersebut, studi ini bertujuan untuk mengetahui bagaimana persepsi remaja di pinggiran Ibu Kota Nusantara (IKN) tentang perubahan iklim. Studi ini menggunakan methods approach dengan desain kualitatif. Data dikumpulkan menggunakan teknik photovoice, di mana foto dan penjelasan remaja dianalisis secara terintegrasi menggunakan analisis tematik. Hasil penelitian ini menunjukkan bahwa remaja di pinggiran Kota Ibu Kota Nusantara (IKN) memiliki persepsi yang reflektif terhadap perubahan iklim, yang terbentuk melalui pengalaman langsung dan didukung oleh perkembangan kognitif mereka. Kesadaran lingkungan mereka tidak hanya mendorong perubahan perilaku adaptif pada tingkat pribadi, tetapi juga memberikan ruang bagi remaja untuk mengemukakan pendapat dan mengusulkan solusi terhadap masalah lingkungan di sekitar mereka.

Kata kunci: Remaja, Perubahan Iklim, Persepsi Lingkungan, Ibu Kota Nusantara (IKN), Photovoice

INTRODUCTION

Climate change is a global issue that has a widespread impact on human life (Palinkas & Wong, 2020; Rahman et al., 2018). Extreme weather phenomena such as heat waves, major floods, prolonged droughts, and forest fires are now occurring with increasing intensity and frequency (Brown, 2020; Hirabayashi et al., 2021; Mansoor et al., 2022). The Earth has experienced an increase in average temperature in recent decades, and this is related to the increase in natural disasters (Ghazali et al., 2018; Wen et al., 2023). This increase in temperature exacerbates climate instability, damages ecosystems, threatens public health, and disrupts various aspects of social and economic life (Atwoli et al., 2021; Pershing et al., 2021). The impact is felt in almost all countries, including Indonesia, which has vulnerable geographical and geological conditions (Djalante, 2018).

Indonesia is one of the countries that is vulnerable to climate change (Ren, 2021). Geographically, Indonesia is

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located in the Pacific Ring of Fire (Reid, 2015) and has a very long coastline (Yang et al., 2023), making it vulnerable to tsunamis, tidal floods, and sea level rise (Adani et al., 2023; Fuad, 2025; Vinata et al., 2023). Unpredictable rainfall also increases the risk of flooding and landslides (Alvioli et al., 2018; Yamamoto et al., 2021), while other regions experience prolonged droughts and extreme heat (Djalante, 2018; Mulyanti et al., 2023). This vulnerability is exacerbated by human activities such as deforestation and land degradation, particularly due to the conversion of forests into agricultural land and oil palm plantations (Erwiningsih, 2023; Petrenko et al., 2016). The loss of forest cover has led to a decline in the natural capacity to absorb carbon and worsened the seasonal crisis (Nath et al., 2024; Setiawan et al., 2025).

Amidst increasingly severe climate change, adolescents are one of the most affected groups in society (Hickman et al., 2021; Vu et al., 2025). This is because they are at a stage of development characterized by sensitivity and awareness of environmental issues (Hahn, 2021; Otto et al., 2019). Climate change can affect how adolescents understand and perceive the environmental conditions around them, especially through unexpected seasonal changes that can disrupt daily activities and comfort (Lee et al., 2020; Wagner et al., 2019). These experiences create uncertainty and encourage adolescents to develop a new understanding of the environmental changes they are experiencing (Busch & Chávez, 2022; Tapia-Echanove et al., 2025). This situation shows that adolescents are not only an affected group, but also need support to respond to climate change in a more positive way (Arnot et al., 2025; Geraci et al., 2024).

Among the younger generation affected by climate change, adolescents occupy an important position as a group that is both vulnerable and has great potential in facing changing environmental dynamics (Bessaha et al., 2022; Clark et al., 2020). They should no longer be viewed as passive parties, but rather as critical and active agents of change (Han & Ahn, 2020; Pereira & Freire, 2021). However, their knowledge of disaster mitigation and protective measures is still limited, especially in Indonesia (Karinawati & Anam, 2024; Martha et al., 2025). Adolescents can play an active role if given the right facilities, but due to the lack of space for participation and policy and educational support, adolescents are under-facilitated in mitigation efforts (Napawan et al., 2017; Setioputro et al., 2025). In fact, adolescent involvement is important for building community resilience to the future impacts of climate change (Harmuningsih & Saleky, 2019; Rakuasa et al., 2024). Such involvement can be strengthened through workshops and training programs, which enhance disaster risk knowledge and support climate change adaptation (Latue et al., 2023). In this study, adolescents' environmental perceptions refer to how they understand climate change, feel its impact in their daily lives, and view their capacity and role in addressing environmental challenges (Lee et al., 2020; Sanson & Bellemo, 2021).

Although the potential of adolescents as agents of change in facing the climate crisis is increasingly recognized, research that specifically highlights their role in disaster mitigation and adaptation efforts is still limited (Jaradat et al., 2024). Most previous studies have focused on children, such as the research by Yildiz et al. (2023) and Kiling et al. (2024) which examined children's understanding of disaster preparedness, as this group is considered most at risk from disasters. Meanwhile, adolescents are often marginalized due to a lack of space for participation and low institutional trust in their capacity (Arnot et al., 2025). In addition, there has been little research examining how adolescents living in the outskirts of the Nusantara Capital City (IKN) understand the environmental changes they are experiencing. In fact, this area is a buffer zone that is directly affected by the development of the IKN (Saraswati & Adi, 2022). The area, which was previously dominated by forests, agricultural land, and settlements, has now been transformed into an area of infrastructure development and a new center of economic activity (Andita et al., 2023). This situation makes the outskirts of IKN a strategic location for understanding environmental changes and the role of adolescents in them (Simanjuntak et al., 2024).

To address this gap, this study uses a participatory photovoice approach to explore adolescents' perceptions of climate change in the outskirts of the Nusantara Capital City (IKN). Photovoice centers the voices of adolescents by providing them with a space to document and reflect on their experiences and mitigation efforts through visual representations and personal reflections (Stephens et al., 2023). In the context of the IKN outskirts, which continue to experience environmental changes due to the transformation of forest and agricultural areas into centers of government and lifestyle (Syaban & Appiah-Opoku, 2024), photovoice offers a way to document the experiences of adolescents that may be overlooked in conventional research. This study aims to understand how adolescents interpret the climate change they experience as part of the region's transformation process. Scientifically, this research expands our understanding of adolescents' perceptions of climate change in newly developing areas that have been rarely studied. Practically, this research is expected to provide input for IKN development policies to be more inclusive of adolescent experiences.

METHODS

Participant characteristics and research design

This study applies a qualitative approach to obtain in-depth data related to the behavior, attitudes, perceptions, motivations, and actions of the subjects, enabling researchers to understand the phenomenon more comprehensively (Agius, 2013). Data was collected using the photovoice method. The purpose of the photovoice method is to enable individuals to identify, represent, and strengthen their community through photography techniques (Anderson et al., 2023). Photovoice was chosen because it makes it easier for participants to express their opinions and experiences through photos. In addition, the value of participation and empowerment presented by this method can encourage the adolescents in the study to become agents of change in their communities.

The study was conducted on the outskirts of the Nusantara Capital City (IKN). The participants in this study were adolescents with junior high school (SMP) and senior high school (SMA) education levels. The total number of participants was seven students, ranging in age from 15 to 18 years old. Participants in this study were selected using purposive sampling with four main criteria: (1) adolescents aged 15-18 years, because they are generally capable of reflective thinking and articulating their perspectives (Oogarah-Pratap et al., 2025; Pakpahan & Saragih, 2022); (2) living in villages on the outskirts of the Nusantara Capital City (IKN); (3) owning a smartphone and being able to operate it; (4) willing to participate in all stages of this study.

Table 1. Participant's Demographic Data

Subject	Gender	Age (years)	Educational level
RS	Male	15	Junior high school
JND	Male	15	Junior high school
SKR	Female	16	Senior high school
FN	Female	17	Senior high school
AM	Female	16	Senior high school
TRS	Male	18	Senior high school
FDL	Male	17	Senior high school

Sampling procedures

This research took place from July 1 to August 30, 2025. Overall, the research process was divided into two main stages, namely the pre-research stage and the research implementation stage.

Pre-Research Stage

The pre-research stage began with the submission of an ethics approval application to the UIN Sunan Kalijaga ethics committee with the number 362.3/Un.02/L3/TU.00.9/06/2025. Next, the researchers obtained permission from the village government and then submitted a permit application to the school through one of the teachers. Once permission was obtained, the researcher was directed to contact the student council to offer the opportunity to participate to students who met the criteria and were willing to be involved. Interested students then signed a written consent form, including parental or guardian consent for participants under the age of 18. Participants were then gathered into communication groups to facilitate coordination during the research process.

Research Implementation Stage

The implementation phase began with photovoice socialization and training, which included explanations of the research topic, basic photography techniques, and ethical rules for taking pictures. Participants were instructed to avoid taking photos that clearly showed individuals without their consent, especially children and vulnerable groups, as well as objects or locations that were sensitive or private. To maintain anonymity, participants are encouraged to focus their photography on environments, symbols, or situations that represent their experiences. After the training, participants are given two weeks to take 3-5 photos that illustrate their perceptions of the climate around the new capital city. This two-week period is provided so that participants have sufficient time for reflective thinking, allowing them to contemplate their experiences and observe their surroundings in depth before deciding on the most meaningful moments and objects to photograph (Fu & Hali, 2025). This study produced 21 photographs taken by seven participants. Next, participants selected 1-2 photos that they considered most representative of their experiences and views on the research theme, taking into account personal meaning, topic relevance, and the photo's potential to spark discussion. From the entire collection of photos, 14 were selected by participants for discussion in a Focus Group Discussion (FGD), which served as a space for collective interpretation. In the FGD, each participant presented their photos and explained the meaning behind the images, while other participants provided responses, reflections, and additional interpretations. The discussion was guided by the researcher using open-ended questions to encourage critical dialogue and build a shared understanding of the collective experiences presented through the photos.

Data analysis

This study uses thematic analysis based on six stages developed by Naeem et al. (2023), consisting of transcription and data recognition, keyword selection, coding, theme development, conceptualization, and conceptual model development. The analysis process began with transcription and data recognition to explore the content of the interviews and mark important sections relevant to the research objectives. The next stage involved identifying patterns, words, or photos that frequently appeared in the interviews, FGDs, and documentation to determine keywords that reflected the participants' experiences or feelings. After that, the researchers performed coding, which is assigning short phrase codes to each piece of information to capture the main message and simplify the data into more theoretical concepts. These codes are then organized into significant groups as a basis for developing themes and exploring relationships between patterns. This process is followed by conceptualization to understand and define the ideas that emerge through the interpretation of keywords, codes, and themes, and organize them into definitions that are consistent with the research objectives. The final stage involves developing a conceptual model that represents the relationships between findings based on theory, thereby answering the research questions and demonstrating the study's contribution. In addition to thematic analysis, this study also used the Consolidated Criteria for Reporting Qualitative Research (COREQ), which consists of 32 checklists with three main aspects, namely the research team and reflexivity, research design, and data analysis and reporting. In this study, COREQ was applied operationally to ensure the transparency and credibility of the research process. Focus group discussions (FGDs) were facilitated by the principal investigator, who had experience in qualitative research and no prior personal relationship with the participants. Professional relationships were established during the socialization and photovoice training stages. Each FGD session lasted approximately 20-30 minutes and was recorded using audio recording devices with the participants' consent. All recordings were transcribed verbatim by the researchers, and the accuracy of the transcriptions was maintained through repeated matching between the transcripts and the original recordings. To maintain data reliability, the analysis process was carried out through reflective discussions between researchers at the coding and theme development stages, as well as systematic recording of the analysis process (audit trail). The application of COREQ ensured that data collection and analysis procedures were systematically documented and produced a more complete, structured, and accountable research report (Tong et al., 2007).

RESULTS OF STUDY

Overall, adolescents' perceptions of climate change in IKN are based on their daily experiences. Photovoice provides an opportunity for adolescents to express the connection between what they see in their environment and what they feel and think. Based on the results of interviews conducted with participants, the three themes above were identified and developed into several sub-themes.

Table 2. Summary of Themes

Theme	Sub-theme
Adolescents' Perceptions of Climate Change	Prolonged Drought High Rainfall
Environmental Awareness in adolescents	-
Voices of Adolescents from the Outskirts of the Nusantara Capital City (IKN)	-

Theme 1: Adolescents Perceptions of Climate Change

Adolescents understand climate change through prolonged dry seasons and high rainfall. They realize that climate change in their region used to be very stable. However, now rain often comes suddenly and the duration of the dry season has become longer.

Prolonged Drought

Adolescents on the outskirts of the Nusantara Capital City (IKN) reported that the current dry season is lasting longer than usual. They reflected on how the prolonged dry season is affecting the physical environment, comfort in activities, and access to basic resources.

"For example, when it's really dry, like when there's no rain, the roads here get really dusty." (JND).

This indicates that prolonged drought is perceived as a recurring disturbance in the daily environment of adolescents, rather than as a temporary seasonal variation.

In addition to dust, adolescents associate prolonged dry seasons with difficulties in accessing clean water, which directly affects daily household activities. This forces residents to seek alternatives such as buying water from the PDAM (Figure 1). However, according to adolescents, buying water from the PDAM is not an effective solution, as residents have to queue and wait for a very long time. Furthermore, water from PDAM is usually dirty and smelly, forcing them to buy clean water again.

Figure 1. A pond with a water discharge that tends to decrease during the dry season.

"During the dry season, we lack clean water... even if we buy it, we have to wait in line for a long time" (TRS).

"Sometimes, when something like that happens, I don't know why, but suddenly the water from PDAM smells really bad, or the box. Sometimes the water is yellow. So when that happens, the only option is to buy water" (SKR).

The adolescents said that prolonged dry seasons do not always have negative impacts, but also positive ones. The positive impact is that residents can save electricity by not using dryers when drying clothes. Figure 2 shows sunny and cloudless weather, which helps clothes dry faster, eliminating the need to use dryers. Additionally, in their area, power outages are common, so the dry season makes activities easier, especially when it comes to drying clothes.

"The weather is hot, so we use less electricity, like the dryer in the washing machine, so we use less electricity" (FN).

Figure 2. The image shows that the weather is getting hotter and can be used to dry clothes, as well as reduce the use of washing machines.

High Rainfall

During the long dry season, heavy rain occasionally falls suddenly. This is one of the aspects they highlight. They relate this to their daily experiences after rain and consider long rains during the dry season to be a phenomenon with a significant impact. Adolescents described sudden rainfall as disrupting their daily mobility. Muddy and slippery roads were frequently mentioned as a source of concern during rainy conditions.(Figure 3).

Figure 3. The roads are muddy and slippery, as if it had just rained.

"When it rains, the roads get muddy, and motorists can fall" (RS).

"Road damage occurs more quickly due to high and unpredictable rainfall" (TRS)

This statement reflects adolescents' awareness of the increased risks posed by unexpected rainfall.

Furthermore, the youth felt that sudden, heavy rain prevented the soil from absorbing the water effectively, which could lead to flooding. (Figure 4)

"Heavy rainfall or prolonged rainfall prevents water from seeping into the ground. This is one of the effects of climate change that causes minor flooding or puddles in residential areas" (AM).

Figure 4. Puddles of rainwater can be seen on the paved courtyard, indicating that the rain was quite heavy.

Thus, both the participants' experiences and the photographs demonstrate that rain is a contributing factor to mobility disruptions in their community.

Adolescents on the outskirts of the Nusantara Capital City (IKN) reported that several ponds serve as a daily water source for residents. During the rainy season, they said the water level in the ponds can overflow, causing flooding. Furthermore, participants explained that water quality can deteriorate after rain, such as becoming cloudy or smelly. They attributed this phenomenon to changes in rainfall that cause mud at the bottom of the ponds to rise to the surface. Therefore, it takes a long time for residents to drink water because they have to wait for the mud to settle. Therefore, heavy rainfall still makes it difficult for them to consume clean water.

"Sometimes the water is dirty, so you have to wait until it's clean. If not, you have to buy more water" (FN).

Theme 2: Environmental Awareness in Adolescents

This theme reflects a convergent pattern of environmental awareness, in which adolescents consistently linked everyday practices to broader environmental and health impacts. The adolescent understood that burning trash was not only a matter of cleanliness or odor, but also produced thick smoke that impacted the environment, health, and air quality. They saw smoke as something that disturbed their comfort and had broader ecological implications through the greenhouse effect. The adolescent's ecological awareness was evident in the way they described burning trash.

"Smoke worsens greenhouse gases" (TRS).

This shows that adolescents have a causal understanding of how the actions of local communities contribute to climate-related problems. Figure 5 shows waste burning behind a resident's house, a behavior that is still common due to the lack of waste management facilities.

"We have a waste bank in this area, but it is no longer operating because the chairman himself said that he manages it alone without any help from the community" (TRS).

Overall, these quotes suggest that adolescents' environmental awareness emerges from the connection between visible local practices and immediate discomfort and broader environmental risks.

Figure 5. Burning trash around the house is still a common practice among the community

This indicates a lack of public awareness of the importance of waste management and maintaining and utilizing existing facilities. It shows an awareness of causality, whereby small actions at the household level can contribute to larger climate phenomena. Thus, this experience helps adolescents form perceptions of how the community's environmental behavior affects the surrounding conditions.

Adolescents said that the smell of smoke from burning rubbish has a pungent smell and is easily carried by the wind, thus disrupting community activities, such as drying clothes.

"The air pollution is pungent, it disturbs me when I'm drying my clothes." (FN)

In addition to disrupting activities, adolescents also said that smoke can have an impact on health. When interviewed, one participant said, *"smoke causes illness" (TRS)*, so its presence is considered a threat to the health and comfort of residents. Thus, smoke pollution is perceived as part of the environmental dynamics that affect their activities, comfort, and health risks.

Theme 3: Voices of Adolescent from the Outskirts of the Nusantara Capital City (IKN)

This theme represents adolescents' voices as expressions of agency and adaptive responses to climate-related challenges. Rather than remaining passive observers, participants articulated practical strategies to manage environmental risks. The voices of adolescents show that living on the outskirts of the Nusantara Capital City (IKN) has made them accustomed to dealing with dynamic climatic and environmental conditions. When interviewed, participants showed a strong adaptive attitude in facing climate change. They offered solutions such as

walking and driving more slowly during the rainy season to reduce the risk of slipping. This solution reflects that adolescents in IKN are highly adaptable to muddy roads and adjust their behavior to stay safe, adolescents also consider infrastructure improvements such as roads to be a solution that can be taken by the village government (Figure 6).

"During the rainy season, drive slowly" (FN).

"The solution is for the village to strengthen the facilities here, because the community center is also located at Kilo 5" (FDL).

Although brief, this statement represents a deliberate adjustment of behavior informed by repeated exposure to unsafe road conditions.

Figure 6. The damaged roads need to be repaired by the village government.

During the dry season, the availability of clean water becomes a major challenge. The adolescents said that the water in the ponds often dries up, forcing residents to buy water. Although buying water is the easiest solution, the process involves costs and long queues. This adaptive strategy shows that adolescents not only observe natural phenomena but also think about ways to deal with their impacts.

In addition to the lack of clean water, adolescents also notice that when the dry season arrives the streets become very dusty. This condition makes it uncomfortable for residents to carry out their activities and has the potential to interfere with breathing. Therefore, adolescents anticipate this by wearing masks when doing activities outside the home.

"If we anticipate it, we can probably get by wearing masks" (FN).

Both strategies show that adolescents can adapt and find ways to protect themselves from the effects of prolonged drought. Their hopes are implicit in the need for a stable water source or support facilities that ease the burden on residents during the dry season.

The issue of pollution is also an important part of their environmental experience. Based on interviews and photovoice, adolescents are aware that burning trash is still a common practice in their neighborhood. The solutions they offer are to reduce the practice of burning trash and find new, more environmentally friendly methods, such as sorting trash and having the village socialize with residents to increase their knowledge about trash, as well as providing temporary trash storage sites in each village.

"The solution is to reduce the amount of waste burned. Find new ways to deal with waste." (AM).

"In my opinion, we need to provide waste collection points. In my area, there aren't enough of them. We also need more education about waste sorting." (AM).

In addition, the adolescents also said that creative efforts in schools are also part of a mitigation strategy that is worth repeating, such as ecobricks. Ecobrick activities are considered an effective way to reduce plastic waste and make waste more useful. In addition to ecobricks, adolescents also highlighted the selection of environmental ambassadors in schools who can act as collaborative actors with local governments on environmental management issues.

"In my opinion, this high school has ecobrick activities, like last year when 10th graders were asked to make 20 ecobricks and we collected all the trash, so we could reduce waste" (FN).

"In addition to ecobricks, yesterday there was also an environmental ambassador election, so maybe the environmental ambassadors can collaborate with the government" (TRS).

These various proposals demonstrate that adolescents understand the dangers of environmental issues and are capable of providing solutions to minimize them.

DISCUSSION

The results of the study show that adolescents in villages on the outskirts of the IKN have an understanding of climate change issues. This understanding comes from their observations of their environmental conditions. Adolescents are in a transitional phase towards adulthood, characterized by cognitive changes in abstract, emotional (Gotlieb et al., 2024), social, moral, spiritual, and physical thinking (Gaete, 2015). Adolescents are also in a phase of understanding complex causal relationships (Keil, 2024; Modrek & Sandoval, 2020) and constructing meaning around global issues such as climate change (Oberauer et al., 2023). Adolescents in the western and central regions, such as Kalimantan, Java, and Sumatra, have a higher level of literacy regarding climate change compared to adolescents in eastern Indonesia (Martha et al., 2025).

Adolescents in this study showed an increased understanding of drought dynamics in the outskirts of the IKN area. Ideally, the dry season lasts from April to October (Badan Meteorologi, Klimatologi, dan Geofisika, 2024), but climate change can cause the dry season to arrive earlier and end later (Jiang et al., 2019; Wainwright et al., 2021). Based on observations by adolescents, the prolonged dry season has turned muddy roads dusty and reduced water flow. Exposure to dust disrupts residents' comfort and daily activities, while reduced water availability has prompted residents to buy water from the local water company. This unpredictable dry season has an impact on the environment and public health (Pandit & Sharma, 2024). Drying soil and increased dust on the roads illustrate the deterioration of environmental quality, which risks causing respiratory disorders (Kanda S. & Permatasari, 2024; Zahrina et al., 2025). The reduction in water discharge during the dry season is also in line with findings that drought can hinder access to clean water and force residents to rely on alternative sources that are not always adequate (Krisdiarto et al., 2020). On the other hand, adolescents pointed out the positive side of the dry season. The heat during the dry season helps dry clothes, thereby saving electricity and facilitating household activities (Mustika, 2024).

This study identifies the instability of weather patterns during the dry season, which affects mobility disruptions and daily activities in the outskirts of the IKN area. This condition is one of the important factors in driving safety that triggers high public awareness when driving (Du et al., 2024; Istiyanto et al., 2025). High rainfall also caused the water source ponds to overflow and stirred up the mud at the bottom of the ponds, which had an impact on water quality. Several previous studies have mentioned that the availability of clean water is increasingly limited and difficult to find in the midst of flooding (Dwiratna et al., 2018; Sutandi et al., 2021). The intensity of extreme rainfall also has an impact on the psychology of the community, such as sleep disorders, anxiety (Lestari et al., 2023; Zhong et al., 2018), feelings of shock and fear (Mujahidah & Suwarningsih, 2021), and stress (Johal & Mounsey, 2016; Nurdiantoro & Arsandrie, 2020).

The environmental impacts they experience firsthand encourage young people to develop ecological awareness. These experiences shape their ability to interpret social behavior as part of broader ecological issues. The way they linked waste burning to greenhouse gases shows that their causal reasoning skills are beginning to develop (Yu et al., 2025). This ability is in line with the cognitive development phase that allows adolescents to begin thinking abstractly and understanding complex causal relationships (Gotlieb et al., 2024; Keil, 2024; Modrek & Sandoval, 2020). This is also supported by empirical findings on the role of real-world environmental exposure in shaping environmental interpretation and risk perception in adolescents (Madera et al., 2025; Thompson et al., 2022; Zhang et al., 2022). Adolescents who have basic ecological literacy and show concern for environmental issues (Rahmania, 2024; Yu et al., 2025).

Adolescents' environmental awareness in the outskirts of IKN is reflected in their ability to adjust daily behaviors to local climate dynamics and geographical conditions. Teen adaptation is not only a reactive response but also demonstrates the development of active strategies to reduce risks and support engagement in pro-environmental behaviors (Martinsson & Ojala, 2024). In addition, this response reflects environmental coping, which is the adjustment of behavior to environmental pressures (Veijonaho et al., 2025) and indicates an awareness that climate change requires serious handling (Deshiana et al., 2022) to minimize negative impacts (Islam et al., 2024). These actions are consistent with psychological studies explaining that direct experience of physical risks encourages adaptive behavior and problem-focused coping (Demski et al., 2017).

In addition to adaptation at the individual level, adolescents highlight the importance of structural support to encourage sustainable waste management practices. These findings are in line with Social Cognitive Theory (Bandura, 2007), which emphasizes the interaction between individuals and the social-physical environment, so the sustainability of environmental management requires the integration of individual capacity and structural support to maintain pro-environmental behavior. The role of schools through ecobricks and environmental ambassadors has the potential to strengthen positive social norms (Alshehri, 2024; Juliana et al., 2022) and green collective identity (Simms & Shanahan, 2024), thereby positioning adolescents as collaborative actors in environmental issues (Gallay et al., 2021). However, this awareness is not always reflected in mitigation actions due to structural barriers, such as the absence of waste collection points or non-functioning village waste banks. The absence of waste banks has led to the community becoming accustomed to burning waste. All participants acknowledged that the burning of waste that still occurs in the community is caused by structural barriers. This condition limits the collective mitigation efforts of young people, even though environmental awareness has been established. This is in line with findings that pro-environmental behavior is influenced by the availability of facilities (Rajapaksa et al., 2018), social norms (Denault et al., 2024), and direct experience (Liu et al., 2025; Zhao et al., 2023), not just knowledge. Nevertheless, the suggestions to reduce burning, sort waste, and optimize village facilities reflect green self-efficacy as the foundation of pro-environmental behavior (Liao & Li, 2019; Razali et al., 2023).

These findings provide an initial contribution to affirming the role of adolescents as important actors in responding to climate change in the social and environmental context of the IKN outskirts, and enable an assessment of the relevance and potential application of these findings in similar contexts. However, this study has several limitations. First, the relatively limited number of participants may restrict the possibility of widespread application of the findings. Second, the focus on a single region with specific characteristics to gain a deep contextual understanding means that the findings cannot be generalized to other regions. The photovoice method used in this study encouraged participants to express their perceptions of environmental issues through visual media. However, this method has several limitations. In the data collection process, researchers gave participants freedom in determining the objects to be documented, but in practice, participants chose objects that could describe their experiences and were socially acceptable. The photographic data produced was based on each participant's perspective, resulting in photos with ambiguous meanings that required further interpretation. In addition, participants faced the risk of reactivity, which caused behavioral changes because they were aware that they were involved in research. To overcome these limitations, this study used discussions between participants through focus group discussions (FGD) to enrich the meanings contained in the photos they had taken previously.

CONCLUSION AND RECOMMENDATION

The adolescents in this study formed their perceptions of climate change through their daily experiences in the outskirts of the Nusantara Capital City (IKN). Through an in-depth qualitative approach using photovoice and interviews, it was found that adolescents understand climate change through experiences of seasonal instability, limited access to clean water, and suboptimal environmental management practices. The transformation of the IKN from a forest and residential area into a national development center has shaped the unique environmental experiences of adolescents, which have not been widely studied in previous research. Therefore, this study makes an important contribution to understanding adolescents' perceptions of climate change in the outskirts of the IKN.

This study recommends strengthening the role of schools as contextual learning spaces by linking the issue of climate change to the daily environmental experiences of adolescents. The local government is also expected to provide structural support, more stable access to clean water, and improvements to basic infrastructure so that adolescents' environmental awareness can develop into sustainable practices. For future research, it is recommended to involve variations in the socio-

environmental context around the IKN to enrich the understanding of adolescents' perceptions and responses to climate change.

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DECLARATIONS

Ethics Approval And Consent To Participate

This study involved human participants and was conducted in accordance with ethical standards for social research. Ethical approval was obtained from the authorized ethics committee at UIN Sunan Kalijaga. Informed written consent was obtained from all participants, and for participants under the age of 18, consent was also obtained from their parents or legal guardians prior to data collection.

Consent For Publication

Written informed consent for publication was obtained from all participants and their parents or legal guardians. Participants were informed that their data would be anonymized and used solely for academic and publication purposes.

Availability Of Data And Materials

The datasets generated and analyzed during the current study are not publicly available due to ethical considerations and the need to protect participant confidentiality, but are available from the corresponding author on reasonable request.

Conflicts Of Interest Statement

The authors declare that they have no conflicts of interest.

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Artificial intelligence-assisted tools were used solely for language editing and clarity improvement during manuscript preparation. The authors take full responsibility for the content, interpretation, and integrity of the manuscript.

Authors' contributions.

Very Julianto and Indra Yohanes Kiling contributed to the study conception, design, and data collection. All authors contributed to the data analysis, interpretation of results, manuscript drafting, and revision. All authors read and approved the final manuscript.

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