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Climate is More Than Just Weather: Gap of Knowledge about Climate Change and Its Psychological Impacts among Indonesian Youth

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ABSTRACT

Climate change is an environmental threat in Indonesia, affecting not only physical and environmental but also psychological conditions. Youth are among the most vulnerable groups in society to the impacts of climate change. However, the attention and involvement of young people on climate change issues are minimal. This study aimed to determine the knowledge and sources of information about climate change, and the impacts of climate change on young people aged 15-29 years. A descriptive qualitative approach with open-ended questionnaires was used for the study with 107 participants. Findings revealed that young people equated climate change with changes in weather or seasons, and also the rising temperatures. Indonesia's climate is increasingly extreme, erratic, and hotter, leading to physical, psychological, and social impacts. Participants felt worried, scared, anxious, sad, angry, panicked, and confused as the psychological impacts of climate change. Surprisingly, instead of experiencing negative emotions, some participants felt nothing and expressed curiosity about climate change. The internet and social media are the main sources of information. Meanwhile, friends are the first option to talk about climate change. Results indicate that Indonesian youth have little understanding of climate change, but they are aware of the crisis. Further research on the psychological impacts of climate change is needed.

INTRODUCTION

Natural disasters like floods, landslides, tornadoes, forest fires, and heat waves in Indonesia are the result of worsening climate change. These natural disasters cause physical, environmental, social, and psychological damage (WHO, 2014). The risk of suffering from contaminated water bacterial infections, impaired breathing due to forest fires, physical injuries, and the threat of suffering from dermatological problems due to extreme heat are some examples of physical impacts (Chan et al., 2019). Moreover, individuals who are victims of natural disasters are faced with homelessness, loss of livelihood, and displacement (WHO, 2014). Other risks that are frequently unrecognized from natural disasters are mental health issues, namely post-traumatic stress disorder, anxiety, depression, suicide (Bourque & Willox, 2014; Cianconi et al., 2020; Clayton, 2021), and well-being (Burrows et al., 2021).

Indonesia has been known as one of the most vulnerable countries to natural disasters due to climate change (World Bank Group & Asian Development Bank, 2021). Natural disasters due to climate change which occurred in Indonesia are not only sudden and immediate disasters, such as floods, landslides, and earthquakes, but also long-term disaster threats such as sea level rise. A 2021 report by World Bank Group & Asian Development Bank revealed that over 4.2 million Indonesians are at risk of permanent homelessness by 2100 due to rising sea levels. Additionally, Indonesia is also threatened with food and clean water shortages in the long run if it does not take action to prevent the deterioration of climate and environmental conditions.

Indonesian society without exception was at risk of feeling the effects of continued climate change. However, some groups feel the impact more than others. Groups that are more vulnerable

to the impacts of climate change are those of low socioeconomic status, indigenous people (Wani & Ariana, 2018), people who depend on nature such as farmers and fishermen, individual women, and young people (Cianconi et al., 2020; Clayton et al., 2023; Coffey et al., 2021). Therefore, studies about the impact of climate change among young people are urgently needed since young people are a group that feels the impact of climate change which is considered a legacy of previous generations (read Corner et al., 2015; Diffey et al., 2022; Lee et al., 2020; Thomas et al., 2022 for comparisons).

Young people became a group of concern in climate change studies for several reasons. Young people are more vulnerable than adults to the health impacts of extreme weather, drought, flooding, and the infectious diseases that often occur in the rainy season such as malaria and dengue, as well as air pollution from fires (UNICEF, 2021). Another reason that young people are more vulnerable to climate change than adults is that they have not reached a stable economic state, therefore making it difficult to survive in times of crisis without relying on adults. Young people are also the group that will live in the future and face the growing threat of climate and environmental crises (Barford et al., 2021). In addition, young people are also the generation that will be in a position as policymakers responsible for providing solutions and policies to climate change and its impacts, thus placing young people in a crucial and important position (Barford et al., 2021; Ojala & Lakew, 2017).

Young people are also more vulnerable than adults to the psychological impacts of climate change. A study conducted among participants aged 7 to 18 years old found that participants tend to feel anger, guilt, hopelessness, sadness, and anxiety over the climate crisis (Thomas et al., 2022). Another study by Hickman et al. (2021) on participants aged 16 to 25 years revealed that 60% of participants felt concern over climate change and crisis, and 45% of them felt the impact on their daily lives. Whilst young people in Australia were worried about the future (48%), experienced neighborhood anxiety (41%), felt stressed and anxious (38%), displayed feelings of despair (28%), felt grief and loss (22%), and experienced loss of sense of place (20%) (Gunasiri et al., 2022). In a similar vein, the latest study by Galway and Field (2023) found that Canadian young people aged 16 to 25 years old

were experiencing feelings of fear (66%), sadness (65%), anxiety (63%), hopelessness (58%), and helplessness (56%) on the thought of climate change. As a result, young people feel the fear of a rather bleak future (Boluda-Verdú et al., 2022; Galway & Field, 2023; Hickman et al., 2021; Schwartz et al., 2022) as well as the fear of losing their livable homes due to the climate crisis (Diffey et al., 2022).

Nevertheless, the aforementioned crucial role of young people in climate change was not linear with the current involvement of young people in discussions on this topic. As one of the generations most affected by climate change and crisis, the involvement of young people is less visible and less heard (Corner et al., 2015; Gunasiri et al., 2022), and even tends to be ignored (Hickman et al., 2021) because they are considered not capable enough and do not have the power. This has led to apathy and feelings of betrayal due to the government's failure to address the climate crisis and provide a safe haven (Hickman et al., 2021). Young people also feel constraints to get involved in the environmental care movement due to limitations to have their own choices (unable to make their own choices), limitations to make structured changes; and constraints to invite friends for fear of being considered too extreme or excessive; constraints to invite parents because they are considered not competent enough to teach superior parents (Thomas et al., 2022).

Currently, research on climate change in young people has mostly focused on western countries such as Europe, Australia, America, and Canada (Corner et al., 2015; Galway & Field, 2023; Godden et al., 2021; Gunasiri et al., 2022; Hickman et al., 2021). While studies related to climate change and psychology in Indonesia remained scarce. Most prior studies in the Indonesian context emphasized pro-environmental behavior (Ambarfebrianti & Novianty, 2021; Arlinkasari et al., 2018; Palupi & Sawitri, 2017; Rifayanti et al., 2019) which to the author's knowledge, from those studies, only one that was focusing on young people (Ambarfebrianti & Novianty, 2021).

Considering the vulnerability of young people to the impacts of climate change and the crucial position of young people as responsible parties in the future, it is necessary to explore further the association between climate change and young

people. Due to the lack of research on the topic of climate change and young people, it is necessary to explore the general knowledge regarding this concept. Therefore, this study aimed to explore young people's perceptions of climate change. As stated by Clayton and Manning (2018), the term perceptions captured a broad range of psychological constructs including knowledge, belief, attitudes, concern, affect, and perceived risk. We refer to Clayton and Manning's (2018) study to examine the cognitive, affective, and evaluative dimensions of Indonesian youth's interpretation of the issue. Hopefully, this study will provide a starting point that can be developed to become a preventive measure and even a basis for formulating policies by the authorities.

MATERIALS AND METHODS

Research Design

The study is a descriptive qualitative research using an open-ended questionnaire. Before data collection, participants were asked to read the description and instructions of the questionnaire and provide consent to participate in the study.

Participant

The participants of the study were collected using a non-purposive *sampling* method via *accidental sampling* in which potential participants who meet the inclusion criteria could participate in the study. The inclusion criteria of the research participants were: 1) age between 15-29 years and 2) willingness to become research participants.

Data Collection

Data collection was conducted throughout June 2023 using the online questionnaire platform (Google form). The questionnaire link was distributed to potential participants through research flyers. Participants who fit the inclusion criteria and were willing to take part in the study can fill out the survey through the link provided.

Research Instruments

Research instruments used in this study comprised two components: demographic and open-ended questionnaires. The demographic section contained questions regarding name (initials), gender with a choice of male or female, and age. The second instrument consisted of 6 questions divided into 2 sections: climate change in general and climate change in Indonesia. The general climate change section revealed knowledge about

climate change, sources of information, and conversations about climate change. The second section related to climate change in Indonesia explored knowledge about climate change in Indonesia and the perceived impacts.

Data Analysis

Descriptive qualitative data analysis was conducted using an iterative thematic analysis approach (see Galway & Field, 2023; Morgan & Nica, 2020). This analysis was utilized to explore answers to open-ended questions. The data analysis process was carried out by the researcher reading the participants' answers, marking meaningful answers, and grouping them into sub-themes that had the same meaning. The sub-themes that have been found will be categorized into major themes from the answers to the questions. There are four themes of research findings, namely knowledge about climate change, sources of information, talk about climate change and impact of climate change.

RESULTS AND DISCUSSION

Demographic of Participants

A total of 111 responses were recorded, and 106 were retained after the exclusion of invalid questionnaires. Most of the participants were female (77%) in the age group of 15 to 17 years old (76%) and 18 to 20 years old (19%). Table 1 demonstrates the participants' demographic characteristics.

Table 1. Demographic of Participants

Aspect	n	%
Sex		
Male	24	23
Female	82	77
Age		
15-17	81	76
18-20	20	19
>21	5	5

Knowledge about Climate Change

Participants' understanding of climate change remained partial, in participants gave answers in the form of manifestations of climate change, such as erratic weather changes, rising temperatures, or global warming. Participants' responses were not comprehensive in describing and illustrating the notion of climate change. According to the

participants' responses, the understanding of climate change was classified into ten themes, ranging from weather or seasonal changes, temperature changes, time frames, wind patterns, greenhouse effect, and climate warming, to natural disasters.

Table 2 showed that participants perceived climate change in the same way as weather or seasonal changes (38%) and temperature changes (20%). Particularly, some perceived that climate change occurs over some time, while others expressed that climate change occurs over a long time. The responses that emerged but in a fairly

small percentage regarding the understanding of climate change were that climate change is an increase in the greenhouse effect (5%) and global warming (4%), where these changes are caused by human activities (4%) such as the use of fossil fuels, deforestation, and industrialization. Other insights include that climate change is characterized by ecological changes (2%) and natural disasters (1%). Further details on young Indonesians' knowledge of climate change are presented in Table 2.

Table 2. Youth Knowledge about Climate Change

What do you know about climate change?		
Theme	Illustrations	% coded
Whether or seasonal changes	"a change in weather from rainy to dry or from cold to very hot"; "extreme weather changes"; "rainfall"; "changing from one climate to another"	38
Temperature changes (increasing)	"drastic temperature changes"; "temperature changes"; "rising temperature"	20
Time frame	"happen in a long period of time" "in a certain period of time"	18
Wind pattern	"changing in the wind pattern"	5
Wind pattern	"changing in the wind pattern"	5
Greenhouse effect	"an increase in greenhouse gasses in the atmospheric layers"	5
Global warming	"global warming" and "global warming phenomenon"	4
Caused by human activity	"caused by human actions"; "result of excessive human activity"	4
Type of human activity	"fossil fuel consumption"; "deforestation"; "industrial pollutant"	3
Ecological change	"change in environmental conditions"; "physical changes on earth"	2
Natural disaster	"polar ice is melting"; "drought"	1

Youths' interpretation of climate change is superficial (Ojala & Lakew, 2017), where they equate climate change with changes in weather or seasons. Moreover, some mentioned natural disasters that are not precisely the definition of climate change but rather the impacts of climate change. However, it is understandable since climate change is challenging to detect from experience or observation. A more mundane phenomenon is the change in weather or seasons, which is often mistaken for climate change (Weber, 2010). This finding is in line with Corner et al. (2015) study in which participants made inaccurate linkages between short-term weather changes and long-term climate change.

In terms of the timeframe for climate change, two different answers were given. Whilst some

participants stated that climate change occurs in the long term, others mentioned that it occurs over some time. The second answer showed a misconception that equated climate with weather or seasons. It's not entirely wrong, yet the knowledge of what climate change means is still not thorough. However, based on the answers submitted, it appears that the respondents' knowledge is moderately sufficient. Contradicting the findings of T. M. Lee et al. (2015) who found that more than 65% of people from developing countries (including Indonesia) were unaware of climate change. The more comprehensive answers of youth's knowledge about climate change can be seen in Table 2.

Indonesia's Climate Change

The research also revealed youth awareness of climate change conditions in Indonesia. Table 3

shows the youth’s perception of Indonesia’s climate change.

Table 3. Indonesia’s Climate Change

What do you think about Indonesia’s climate change?		
Theme	Illustrations	% coded
It is in extreme condition	"Indonesia's climate is changing drastically"; "Climate change in Indonesia is extreme"; "very bad"; "It is extreme, because the changes are apparent"	35.6
It is erratic	"climate change in Indonesia is very erratic"; "It is erratic, and changes drastically"; "very unpredictable"; "The changes are very erratic"	32.2
It is fine, nothing happens	"It's just fine"; "It is pretty good"; "Because Indonesia has a tropical climate, in my opinion, it's fine"; "It won't happen"	12.6
It becomes hotter	"during the dry season, some areas become very hot"; "I feel that the temperature in Indonesia has been very hot lately"; "The heat is too much and even in the rainy season it's still hot";	10.3
Caused by human activity	"are mostly caused by humans such as illegal logging and burning of forests"; "caused by human activities such as changes in land use and the use of fossil fuels"; "due to massive deforestation"	9.2

Based on the data from Table 3, participants were separated into two groups, those who believed that Indonesia's climate was in a bad state (78.1%) and those who believed that Indonesia's climate was fine (12.6%). Indonesia's climate is in extreme situations (35.6%), erratic (32.2%), and becoming hotter (10.3%) according to those who think Indonesia's climate is worsening. This climate change happened due to human activities that continue to cause harm without trying to compensate for it with pro-environmental activities. The results support a previous study that found a similar finding (Ariestya & Paramitha, 2022).

Despite the low level of knowledge about climate change, young people are aware of this issue. They believe climate change is happening and feel its impact. The majority of participants see climate change in Indonesia as a real threat, while the rest do not notice any changes. Rising temperatures are considered a sign of climate change, similar to the findings of T. M. Lee et al. (2015) in the US population. People tend to rely on everyday signs to refer to the changing climate. Indonesia is an equatorial land that receives sun exposure throughout the year, when heat levels are

higher than normal, people will raise their awareness of climate change.

Meanwhile, those who believe that Indonesia's climate is benign, referring to Kurth and Pihkala's (2022) term, are categorized as deniers, i.e. people who do not believe climate change is happening. Additionally, those who noticed the changes in Indonesia's climate said it was because of human activity.

Source of Information

The internet and electronic mass media were found to be the main sources of information on climate change with 35% and 24.3% respectively. The keywords “Internet” and “Google” were the most mentioned in Internet sources, followed by “Social media” and “News” in the electronic mass media category. The school became the next source of information where participants obtained information about climate change from teachers or subject matter with a percentage of 15.3%. Participants used more than one source to find information regarding climate change. A more complete overview of sources of information on climate change can be seen in Table 4.

Table 4. Sources of Knowledge about Climate Change

Sources	Words commonly used	% coded
Internet	"Internet"; "Google"; "Website"	35
Electronic mass media	"Social media"; "News"; "News from television"	24.3
School	"Teacher"; "School material"	15.3
Book	"Book"; "School book"	9
Society	"People in the neighborhood"; "Society"	6.8
Printed mass media	"Magazine"; "Newspaper"	6.2
Self-knowledge	"My thought"; "On my opinion"	3.4

The internet and electronic mass media (including social media) are the main sources for young people to access information related to climate change. It supports Maran & Begotti's (2021) and Baldwin et al. (2022) research finding that social media, news, and television programs are sources of climate change information. In this study, respondents ranked the internet as their first-choice source, while the two previously mentioned studies ranked social media and TV programs, respectively. This is understandable since the vast development of technology has allowed young people to gain wider information, including about climate change (Parry et al., 2021). Internet-based technology, i.e. social media, could provide helpful tools for young people to become aware of climate change, albeit information on social media should be interpreted with caution due to its risk of heightening climate anxiety among young people (Anderson, 2017; Kricorian & Turner, 2022), as Nadarajah et al. (2022) found that the tendency of information seeking may increase climate anxiety.

Talk about climate change

The study revealed that almost all participants (98%) had talked about climate change, with friends (53%) being the most frequent discussion partner, followed by family (24%) and teachers (20%). Table 5 shows the results of with whom Indonesian youth talk about climate change.

Table 5. Discussion about Climate Change

Have you ever discussed climate change?			
	%	nM	nF
Yes	98	22	76
No	2	2	7
With whom you discussed it?			
	M (%)	F (%)	
Friend(s)	61	53	
Family	14	24	
Teacher	21	20	
Other	4	3	

Based on the participants' responses, it was not possible to know how deep the discussion was, as there were no questions that led to this. However, discussions with friends were mostly carried out when there were lessons or assignments related to nature, where participants said that they discussed with "school friends" or "classmates". In the family context, participants mostly discussed climate change topics with family, parents, and siblings.

Subsequently, most young people were often discussing climate change with their peers instead of other groups of acquaintances (such as family). Previous similar results were reported that young people discuss climate change with friends, family, and teachers (Baldwin et al., 2022; Kricorian & Turner, 2022). This is because at the youth stage, they tend to prioritize social relationships with their peers (Arnett, 2014). Furthermore, young people's self-esteem is influenced by their friends' opinions, hence why peers' opinions are considered more important by young people. It includes discussions on climate change, as young individuals are curious about their peers' thoughts on the issue, which can then influence their opinion on climate change.

Talking about climate issues is important, as this discussion will raise young people's awareness and concern about the climate crisis and preventive mitigation (Baldwin et al., 2022). Even when people talk with those who don't believe the crisis is happening, it still has a positive impact (Corner, et al., 2015).

Impacts of Climate Change

Participants experienced the physical, psychological, and social impacts of climate change. The physical impacts include impacts to the environment and impacts to humans directly. Climate change was causing air temperatures to rise, therefore participants were feeling the extreme heat. Climate change can also cause environmental damage that can lead to natural and ecosystem

disasters. The physical impacts that humans directly experience due to climate change were health impacts, which refer to humans becoming more vulnerable to various types of diseases. This finding supports Sulistyawati et al. (2018) study that young people are aware of climate change's impacts on health, and that they feel these impacts. Erratic changes in climatic conditions, especially rising temperatures, result in seasonal fluctuations in various types of infectious diseases, which can cause disease outbreaks and threaten human health (Gulzar et al., 2021; Meierrieks, 2021).

Results also showed that the psychological impact of climate change was the emergence of

various negative feelings and emotions. Participants mentioned negative feelings such as worry (13.1%), fear (10.3%), anxiety (3.4%), sadness (2.8%), anger (2.1%), panic (1.4%) and confusion (1.4%). Interestingly, feelings of curiosity among participants were found associated with climate change, which provides a novelty finding that was never found in any studies in this field. Most of the participants reported that when they think about climate change, they are curious and want to know how the phenomenon happens. More detailed results are presented in Table 6.

Table 6. Impacts of Climate Change

What do you feel when you think of climate change?			
Theme	Sub-theme	Illustrations	% coded
Physical Impacts	Temperature is rising	"the dry season is extremely hot"; "It's very hot during the day"; "it is getting hotter or drier"; "affecting the rise of the earth's temperature"; "hot"	18.6
	Ecosystem and natural disaster	"Water scarcity"; "forest fires and floods"; "the rising of sea level"; "prolonged drought"; "the loss of valuable ecosystems"; "threat to biodiversity"	13.1
	Health impacts	"the risk to human health"; "the body becomes prone to dizziness"; "I got flu disease"; "caused the immune system to weaken"; "it makes my body more prone to illness"	9.7
	Unpredictable weather	"The weather becomes unpredictable"; "sudden changes in temperature"; "the temperature of the air can become hotter or colder"; "climate changes in extreme and irregular ways"	9.7
Psychological Impacts	Worry	"To be honest, I feel scared and worried sometimes when the thought of climate comes up"; "Worried and afraid if climate change continues to occur, it can cause the earth's system become unstable"; "My feelings are definitely worried"	13.1
	Afraid	"I'm afraid during extreme weather"; (I feel) afraid and worried" "a little scary"; "(I'm) afraid"	10.3
	Curious	"I'm very curious to imagine how such a change could happen in a relatively short period of time"; "A feeling of curiosity"	6.2
	Feel normal	"(I feel) normal"; "sometimes it's normal"; "normal"	3.4
	Anxious	"(I feel) anxious, shocked, and worried about the climate in Indonesia"; "Anxious"	3.4
	Sad	"I am sad when the climate changes in extreme and irregular ways because it brings huge impacts"; "It's a mix of curious and sad (prihatin)"; "Between upset and sad"	2.8
	Angry	"Sometimes when the temperature around me becomes very hot due to extreme climate change, I find myself getting angry"; "Between upset and sad";	2.1

	Panic	"sometimes (I'm) panic"; "(I feel) confused and palpitated"	1.4
	Confused	"(I feel) confused and palpitated"; "a little scary and uncertain"	1.4
	Don't Like	"I don't like it because it's destructive"	0.7
Social Impacts	Economical impacts	"widespread economic impact"; "the farmer has no idea of what would happen to his plants"	1.4
	Need to adapt with the situation	"changing previous habits and adapting to them"; "not yet adapted/adjusted"	1.4
	Thought of future	"I think about my environmental conditions in the next few years"; "Thinking about what might happen because of the climate"	1.4

Finding that youth reported psychological and physiological impacts was also supported by a prior study which found that youth experienced the most significant impacts of climate change compared to other age groups (Clayton et al., 2023; Hickman et al., 2021). Young people are already aware of the possible impacts of climate change, but they find themselves in a difficult position because their voices are usually not considered relevant enough to be heard by mostly older policymakers (Corner et al., 2015; Hickman et al., 2021). It puts young people in a position to be impacted from various aspects, because they are aware of the situation, but are unable to take action.

The psychological impact experienced by respondents is similar to the findings of previous research (Hickman et al., 2021), namely worry, fear, anxiety, sadness, and anger. In addition to these negative emotions, a novel finding of the study was the emergence of curiosity about climate change processes, indicating that respondents did not feel any psychological impact. The absence of negative emotions may be due to psychological distance toward the climate crisis. Dodds (2021) stated that climate anxiety would be experienced by those who are aware of and threatened by climate change. When people do not perceive climate change as a threat, they won't be anxious about the climate crisis.

Climate change is not perceived as a threat because it occurs slowly, while humans tend to perceive situations as threatening when they are immediate, fast, and visible, such as Covid-19. In addition, it is also due to psychological distance, as the climate crisis is a wide-scale problem that does not directly affect personal lives (Quiroga, 2022).

When individuals do not acknowledge the existence of a climate crisis, they are less likely to feel a psychological impact although being exposed to information.

Participants also experienced a social impact, albeit not as much as the physical and psychological impacts. Participants thought of social impacts in terms of the economy, the need to adjust, and future possibilities. The description of the climate change impact can be seen in Table 6.

CONCLUSION

Climate change is an important issue, considering its worsening condition. Indonesia as a prone country to its impact requires concrete action from its citizens to mitigate, hence young Indonesians are expected to become the agents. Young Indonesians' knowledge of climate change is still low, as they equate climate with weather. However, young people's awareness of Indonesia's climate conditions is high. Technology-based information sources and the internet are the main sources, and this needs to be utilized by policymakers to increase environmentally conscious actions to mitigate worsening climate change. Respondents talked about climate change mainly with friends, family, and teachers, however, the context and depth of the discussions were unknown. Discussions on climate change issues are essential to raise young people's awareness and engagement with the issue. Furthermore, respondents felt both the physical and psychological impacts of climate change. Multi-stakeholder partnerships are needed to address the physical and psychological impacts felt by young people. Future research that focuses

on the psychological impacts of climate change is warranted, as these impacts are real and threatening.

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