

# Middle school student's perception of climate change at Boyolali District, Indonesia

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**Abstrak.** The knowledge of climate change is essential. Understanding about the causes, consequences, and also solutions is one of the main keys of knowing how far the students care about climate change issues. This research aimed to identify the middle school students' knowledge of climate change in Boyolali district, Indonesia. The sampling technique was stratified random sampling by classifying the district. The district is classified into the urban fringe zone, urban-rural fringe zone, and rural-urban fringe zone. The sample of school was taken from each zone and the number of students is selected purposively. The data were collecting using questionnaire with parameters including the knowledge of the climate system, causes, consequences and solutions of global warming, contextual knowledge about human-caused, and practical knowledge about global warming. The result showed that students who attend school in the urban area have a higher understanding of global warming than who attend school in the rural area. 96% of students believe that global warming is happening and 35% of students understand that global warming is caused mostly by human activities.

## 1. Introduction

Recently awareness about the causes and effects of climate change have increased rapidly. Peoples ability to understand climate change have become the main issue globally. Hence, it is important to increase the knowledge about climate change as one of the aspects that are being seen as a first state to solve the causes and effects of climate change in society.

How the public understands, communicates, and manages climate risk will be important issues as climate change continues to gain momentum as the environmental issue of the 21<sup>st</sup> century. Along with the effects of global warming started to grow, studies about these phenomena is increasing lately [1]. Furthermore, the rising of human-caused evidence of climate change has been proving along with the concerned of climate science and Earth's climate over recent decades [2].

Global warming is one of the main aspects that triggered climate change. Global warming is a phenomenon in atmosphere. There will be a steady warming of 1-2°C in the early decades of the twenty-first century. It will affect a decrease of crop yield both in seasonally dry and tropical region, on the other hand, it may bring benefit for crop and yields in the moderate region. All region will be negatively affected by this continuously warming in the second half of the century, though agriculture in some developing countries in semi-tropical and tropical regions will endure the impact of the effect [3].

Global climate change is the hottest environmental issue today, and it will continue in the future. This is because of its devastating impacts in different ways. Global climate change caused by both natural factors such as volcanic eruption, variation in the Earth's orbital characteristics and variations in



solar output, and human-induced causes mainly by the emission of greenhouse gases. It is not a new phenomenon, but the warming that is occurring today is unusual by the rate of its change [4].

The climate systems have a complex and correlative system consists of atmosphere, land surface, snow, and ice and also bodies water on earth and all the living thing [2]. Later on, the climate system is influenced by internal and external factors. Internal factors are because internal influential and external factors are because changes occur in external factors called 'forcing' that involve climate. Volcanic eruptions as a natural phenomenon are the example of external energy as well as the human-caused an the atmosphere such as in composition changing in the atmosphere [2]. Conforming to another statement, the impact along with warming phenomena is people in the world could starving, lack of water and flood in the coastal area [5]. In the other side, along with the absence of rains, agriculture product will droop and livestock will wither, endanger children to feel hunger and decreasing clean water for hygiene and also drinking. Furthermore, nearly all the children in the world frequently will suffer hotter and another extraordinary temperature, the hotter temperature will influence children's health condition directly by heart stroke rates rising, heat debilitation, and other mortality that associated with heat. Indirectly, exaggerated heat is probable to influence children to interrupting the systems of agriculture, increasing prices, and rising food deficit [6].

The consequences of climate change vary in many forms and effects both adults and children [7]. The direct effects of unusual heat, lack of water, and natural disasters children are more susceptible physically than adults [7]. Recent children and future generations will carry an unequal share of the difficulty of climate change, which will influence child contented state through various direct, indirect and societal pathways. According to the assertion that what children learn today will shape tomorrow, introducing environmental knowledge at an early age is a proper way to protect the environment. A plan that rise the availability and quality of environmental education are important for long-term revolution. Schools are the perfect platform for developing children's environmental understanding. Increasing climate change knowledge in education is one of the finest ways to make the students have a better understanding of climate change [5]. Knowledge of how climate change will influence children who live through it needs a specific focus [6]. The first step is by knowing the students' perception of climate change. The current state of students' climate change knowledge could lead to making the right decisions about what to do to reduce the negative effects of climate change on children as they are more vulnerable than adults. Furthermore, enriched knowledge of public idea about global warming can make contributions to apprised scientific and policy discussions of climate change [8].

This study intended to know the students' knowledge towards climate change phenomena in Boyolali District, Indonesia. The rationale of this research was to address the climate change perspective among the Indonesian students, especially in Boyolali District. There is some essential reason that students ought to consider in climate change perceptions research. In the beginning, students could act on their own so their perception could have a differ than adults. Secondly, students might be affected by climate change in many different ways. The last, students are going to be the future generation so by knowing their perceptions about climate change, the students could be better educated. Emerge from climate change issue the study about climate change and children is necessary.

## **2. Method**

This study was conducted using quantitative methodologies. Questionnaires were used to collect the data on students perceptions. The average age of the students in this study was 13-15 years. Middle school students (ninth grade) in Boyolali were asked to fill out the questionnaire about climate change. Student's perceptions grouped by geographical classification. This classification included urban fringe zone, urban-rural fringe zone, and rural-urban fringe zone. The consideration was the perception of global warming might be different because of the geographical characteristic. The rural and urban students might have a different point of view about global warming phenomena. Examining climate change, local peoples and minor populations permit particular consideration. The effects of climate change on indigenous' regions and communities are prevented to be both easy and difficult because of the location in susceptible environments, including small islands, high-altitude zones, desert margins and

circumpolar Arctic [9]. Local and rural resident, nevertheless, are barely potential victims of global change. Awareness of environmental vulnerability, shift and trends is an essential sector of their culture. Community-based and local understanding may suggest useful perception into environmental change because of climate change, and complete large scale of scientific study with native accuracy and slight differences [9].

### 3. Result and discussion

The perception of climate change divided into some categories including knowledge, mitigation and adaptation, and attitude toward climate change. The most interesting thing is that 96% of student in all zones believe that global warming is happening. Later, in all three zones, 35% of a student considered that global warming was caused mostly by human activities. By 98% of student in all zones expected that they ever heard about the greenhouse effect, however, only 31% of them correctly answered what greenhouse was. By 90 % of student in an urban fringe, zone determined that coal is a fossil fuel compared to 60% and 58% of student in urban-rural fringe and rural-urban fringe zone. Knowledge of global warming was differing in all zones. As a state that the consequences of global climate change to children are predicted to be pervasive, geographically varied, because of economic condition and social condition [7]. Afterward, more than 50% of student did not know which gases in the atmosphere are good at trapping heat from the Earth's surface, only by 43% of student correctly answer that carbon dioxide, methane, and water vapour are great at isolating heat.

Despite the correct answer from the student, it is noticeable that more than 50% of student in all three zones did not know about greenhouse effect. Furthermore, a student in the rural-urban fringe zone was the least at answering about the materials that contribute most to global warming followed by the student in the urban-rural fringe zone and the urban fringe zone. In all zones 80% student did not understand which material was supply most to global warming. This was striking because a student in all three zones did not notice the consequences of global warming, on the other side, it is important for student to understand the effects of climate change because climate change would affect them indirectly, agreeing with the statement that the loss in the environment because of climate change may harm children for instance, the world's oceans acidification will decrease food supplies, and disease-carrying insects will swarm over new areas as a response to change temperatures and rains [6].

It was found that more than 45% of student in urban and urban-rural zone think that the speed of ice melting was increased however student in rural-urban fringe zone thought differently, by only 17% of them believe that that speed increased. Agreeing the statement that the consequences of climate change impact differently determined by children's social condition, gender, settlement (rural-urban), and education status, later on, children from very socio-cultural background will have diverse ideas about disaster risk [10]. Furthermore, the result showed that unfortunately, no more than 50% of them did not realize causes of global sea level rises, It is essential for children to know about rising of sea level as agreeing with Oppenheimer M and Anttila-Huges J K (2016) that the rising of sea level have direct danger to children which the rising of sea levels are predicted to enlarge erosion and make storms surges getting worse by interacting with cyclone and extract cyclone [6]. In addition, more than 85% of student never heard about coral bleaching and ocean solidification. It can be concluded that student notice that global warming actually happening, on the other hand, most of the student did not get the idea about the causes and consequences of climate change. It is also remarkable that the rural-urban fringe zone had the lowest level of knowledge compared to the other zone.

Almost all of the students extremely sure that global warming is happening, still less than 50% of them in all three zones did not worry about global warming phenomena. The highest was in the urban zone in which 42% of them very worried about it. The interesting part was that 3% of a student not at all worried about these phenomena. Furthermore, a student in all zones realizes their condition on knowing the global warming issues, by 47% of them were very well informed about the climate system. It is also remarkable that in average 50% of student was fairly well informed about the causes, consequences and also a solution of global warming, even though the result showed that student understanding about the causes, consequences were really low.

Student in urban area had better understanding on greenhouse phenomena than student in rural zones. When the students were asked about the matter that gave a contribution to global warming by less than 60% of them answered the correct answer. The student did know the materials that can cause global warming and indirectly they would hard to find the solution that could decrease the global temperature. In term of global warming mitigation, most of the student in the rural-urban fringe zone did not know the step to reduce global warming. Along with the statement that children act and respond differently from adults, they are less likely to maintain their own heat risk and may have fewer method to escape heat; as example, because children do not plan their own schedule, they can not skip activity on a hot day, and very young children can not tell adults that they suffer heat's effect. [11]

Furthermore, a student in urban-rural fringe zone suggests that replacing fossil fuels to renewable energy, planting trees, and decrease tropical deforestation helping a lot reducing global warming on the contrary, a student in urban fringe zones by 44% did not know what to do to decrease the global warming. Student in the three zones got the information about global warming mostly from schools, internet. The result showed that the education resources about climate change issues are announce by non-governmental organization and its growing faster. Government have an important role in making policies as an action to reduce the negative effect of climate change. As state that Governments have major responsibility for adopting policies as an action to climate change [7].

With all the circumstances, student understand their condition on knowing climate change issue, student in all zones place themselves need a lot more information by 46%, 28% of students said they need some more information, only 8.8% of them think that they need a little information, and small amount of them by 3.5% did not need more information. Furthermore, student attitude toward global warming as they were worried. Students suggest that global warming could be reduced by replacing fossil fuels, planting trees and decreased deforestation. Students got the facts about global warming mostly from schools, internets, and tv. A student in the rural-urban fringe zone had the lowest knowledge of global warming, the highest was a student in urban fringe zones and student in the urban-rural fringe zone was placed in second place

#### 4. Conclusion

In general, this study found that student' knowledge of climate change diversified in urban, urban-rural, and rural-urban fringe zone. Student' who study in the urban fringe zone have the highest understanding about climate change followed by student' who attend school in the urban-rural fringe zone, and the least was a student' who study in the rural-urban fringe zone. From the result presented it known that student understands that global warming is actually happening however they did not know yet the causes and consequences of global warming. The result also showed that student' adaptation dan mitigation was not good enough. However, the student realized the lack of their knowledge, it found from the answered that in the three-zone think that they need a lot more information about global warming.

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