



# Do Students' Perceptions of Public and Private Schools Differ on Climate Change Health Among Senior Highschool in Thailand?

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**Abstract.** This research was designed to understand how perception regarding climate change and its health impact among grade 10<sup>th</sup> to 12<sup>th</sup> students in private high school and state high school are differed from one another, the cross-sectional survey research was conducted in Nonthaburi province where it located in the middle part of Thailand, which faced highly environmental impacted caused by climate change. Study participants were recruited randomly from 20 school, seven of which were private school. 338 students completed self-report questionnaires to document their perspectives on the school environmental questionnaire, how it impacted to their health. The result has shown that most of participants have high level of environmental perception. However, state school student was likely having higher environmental consciousness than private school student. Overall, students are mostly concerned on environmental problem and climate change, but their environmental knowledge on some basic concepts are still needed to be improved.

**Keywords:** Climate Change · Health · Perception · Student · Private High School · State High School

## 1 Introduction

The term “global warming” refers to how human actions, particularly the combustion of fossil fuels and deforestation, affect the climate [1]. Human activity results in greenhouse gas emissions into the atmosphere [2]. It was proposed to be a contributing cause for many environmental problem and various disasters in all continents [3]. It is predicted that melting glaciers will cause avalanches, floods, and mud flows in the Alps and other mountain ranges; that heavy rains in the UK will likely lead to widespread erosion; and that the melting of the Greenland and Antarctic ice sheets will result in underwater landslides and tsunamis that may even hit the seas near Britain [1]. Apart from the fact that Climate change effected to environmental problem, health impact of climate change should be considered simultaneously. Global warming's consequences may not always be evident, and they do not always mean that the prevalence of arthropod-transmitted diseases would rise [4]. Major outbreaks of Rift Valley fever have been brought on by

flooding associated with El Nio in eastern Africa, which has increased the breeding grounds for mosquito vectors and brought cattle and people closer together [5]. One of the worst summertime outbreaks of yellow fever (a virus spread by the *Aedes aegypti* mosquito) in the southern United States occurred in 1878, during one of the worst El Nio occurrences on record.

With an estimated 20,000 fatalities, the economic and human cost was significant. It is common knowledge in developed nations now that influenza epidemics repeat in the middle of winter [6]. A combination of higher fertilizer concentrations and warmer water temperatures could lead to an increase in the frequency of cyanobacterial blooms [7]. Climate change play a big role in Thai agricultural industry, it impacted to many agricultural productivities including rice, sugarcane and fisheries. Flash flooding and the resulting landslides will progressively threaten the entire country of Thailand. Lowland crops including rice, maize, and soybeans will be most severely impacted by flash floods. As with other crops like soybean, coffee, pineapple, and rubber, maize will be more adversely impacted by the anticipated rise in temperature because it directly affects people's quality of life. By 2050, Northeast Thailand might anticipate an increase in the yield of rainfed rice. Higher rainfall and CO<sub>2</sub> fertilization are credited with increasing yields. CO<sub>2</sub> fertilization counteracts the detrimental effect of the rise in temperature.

This modeling does not account for the detrimental effects of CO<sub>2</sub> fertilization on grain protein that have been demonstrated in recent studies. Temperatures above 35 °C during the growing stage will result in lower yields for both rice that is grown by irrigation and by rain. Rice yield will also be impacted by the rise in the nighttime minimum temperature. It has been shown that rice in the Mekong Delta would be extremely susceptible to rising temperatures during the dry season. Both irrigated and rainfed rice will be impacted by saline water intrusion and sea level rise, which will result in lower water quality, a shorter growth season, and longer and more intense floods. Conflict between competing water users may arise from increased water use brought on by higher temperatures in the late dry season or during droughts.

A rise in rainfall will put soy, rice, maize, and coffee at risk. Increased precipitation will have an impact on lowland soils with poor drainage for crops that cannot tolerate standing water. If rainfall is too high during the harvest and post-harvest period, it will also have an impact on crop yield, causing even more losses. In 2050, it is expected that there will be water logging and an increase in the amount of rainfall during those crucial times. Furthermore, workers' productivity is directly impacted by the increased heat exposure brought on by climate change. The negative consequences of heat exposure in the workplace should be given priority over other issues. It's important to draw attention to additional effects of heat exposure. Thailand has been transitioning from an agricultural economy over the previous few decades to one that is an emergent industrial economy [8].

Regarding the issues, the risk of environmental impact of Thai adolescences is significant, UNICEF revealed that Thailand is assessed as a country with the "ultimate risk" aspect (8.4 out of 10) while the vulnerability aspect of Thai youth is "Low vulnerability" (2.3 out of 10) when these two factors were calculated together. This makes Thailand classified as having a high level of environmental risks affecting children (6.2 out of 10) according to Children's Climate Risk Index: CCRI [9]. Thai students still have a poor

perception of their environment. That is, there is a significant disconnect between theory and practice in Thai environmental education. Lack of engaging extracurricular activities or field excursions and a shortage of trained teachers are a couple of the issues that contribute to this disparity. Regular classroom lectures are a common delivery method for instruction, but these lectures bore the students and make it difficult to increase their environmental knowledge and concern [10].

Our study is mainly focused on Target at Nonthaburi Province, it is a heavily populated central Thai province that lies northwest of Bangkok, in the Chao Phraya River basin, all living in an area of 622 km<sup>2</sup>. In terms of its levels of pollution, its cities come in fairly highly ranked in terms of all the most polluted cities in Thailand, although they were lacking the more destructive levels of pollution that the upper echelons of polluted cities suffered from. All three of its registered cities came in with moderate ratings, which in order to be classed as 'moderate' in terms of air pollution, requires a PM 2.5 reading of anywhere between 12.1 to 35.4  $\mu\text{g}/\text{m}^3$  [11].

The majority of Nonthaburi's development zones are situated in the Chao Phraya Basin's flat, low-lying floodplain, which ranges in height from 1 to 3 m. A stationary flood typically results when the water level in the Chao Phraya River and key canals is already high, especially when there has been a lot of rain [12]. Given the high level of flood danger in Pak Kret Municipality, it was predicted that flooding there in 2011 may reach a height of at least 1.50 m. Improvements in energy efficiency and vehicle fuel economy, increases in wind and solar power, biofuels made from organic waste, placing a price on carbon, and protecting forests are all effective ways to reduce the amount of carbon dioxide. However, it cannot be achieved if the general public is unaware of the impact of climate change on their daily lives, particularly young people. Compared to pupils with lower knowledge scores, those with higher knowledge scores exhibited more favourable attitudes about the environment [13] According to the UN Population Division's 2019 forecast, the world's population, which was estimated to be 7.8 billion as of 2020, will peak at 10.9 billion people by the year 2100. Human activities, such as the use of fossil fuels, deforestation, and unsustainable agriculture, contribute to climate change, which reduces the availability of wholesome food and clean water and destroys ecosystems and secure living environments, all of which have a direct impact on the world's population.

This paper aims to investigate how knowledge of climate change or global warming and health are differed among teenager of private school and state school Nonthaburi, Thailand, it proposed to help us understand general perception of teenager. It is able to utilize and adjust to the further educational regulation.

## 2 Methods

The study was about the comparison of students' perception regarding climate change and health among private high school and state high school in Thailand. The research takes place in Nonthaburi Province, Thailand. Since December 5<sup>th</sup>, 2021, study has been ongoing until all the data have been gathered. We split the school into two divisions as a result: public high schools and private high schools. Purposive sampling is the sampling technique employed in this study because the number of respondents was limited to 338 pupils, including 216 private school students and 122 private school students.

The three sections of the survey's online questionnaires are basic inquiries, questions about climate change and health, and source information preferences. Twelve questions about how people perceive climate change in general were included in the first section. The second section of knowledge focuses on how climate change affects the environment and human health. There were 12 questions, and the respondent received 1 point for each correct response. The final section dealt with preferred information sources [14].

The data used in this study are answers from questionnaire survey conducted by researcher, it included questionnaire and knowledge of health and climate change, and their perception and awareness towards the influence of climate change on human health and the environment. Data gathered from questionnaire were checked and analysed according to research design describe is using Microsoft excel and prepare for presentation.

### 3 Result

The result on the first part has shown that students in private school who scored 10 (Table 2) on each question had concerned more to the other issue compared to climate change, while student in state school seem to be prioritized to global warming (Table 1). Compared to 25.00% of respondents from state schools, only roughly 12.29% of participants from private schools believed that the level of community seriousness about climate change was very serious.

Regarding the participants' opinion on their own perception, it illustrated that around 17.21% in private school believed that they were extremely concerned about climate change compared to 24.53% of state school student. Therefore, the average perception of general framework on climate change of state school student seem to has higher perception (60.49%) compared to private school (49.09%), as the result, we assumed that state school students have higher perception than private school students, to be more precises, we made hypothesis and test hypothesis by using Two Sample T-Test (Welch's T-test) [15].

$H_0$ : There is no significantly different from the perception of both group of samples.

$H_1$ : There is significantly different from the perception of both group of samples.

According on Table 3, The observed standardized effect size is large (4.02). That indicates that the magnitude of the difference between the average and average is large. Sig is  $< .00001$  which is less than 0.05 that rejects the main hypothesis ( $H_0$ ) and accept the secondary hypothesis ( $H_1$ ) which means that there is significantly different from the perception of both group of samples. As the result we can proof that student in state school have higher perception than private school.

Apart from that, if asking on perception of the health and environmental related problem, the result has revealed that state high school student' perception regarding health and environmental related problem are 6.19% higher than private school student. In order to test hypothesis, the Two Sample T-Test (Welch's T-test) has been used on this part.

$H_0$ : There is no significantly different from the perception regarding health and environmental related problem of both group of samples.

**Table 1.** The climate change perception in the general frame-work among each group of State School Students

1. Perception of the important problem	N=216	%
<i>International terrorism</i>	49	22.69
<i>Poverty, food and water scarcity</i>	63	29.17
<i>Increase of the elderly</i>	58	26.85
<i>Infectious disease</i>	54	25.00
<i>Global economic crisis</i>	61	25.58
<i>Global population growth</i>	56	25.92
<i>Global warming and climate change</i>	72	33.33
Perception of the level of community seriousness towards the climate change issue, scaled between 1 to 10		
10	54	25.00
5	3	1.39
1	0	0
Perception of the level of respondent seriousness towards the climate change issue		
10	53	24.53
5	6	2.77
1	0	0
2. Perceptions of the important problem		
<i>Various consequences of climate change</i>		
Totally disagree	8	43.70
Disagree	33	15.28
Agree	43	19.90
Totally agree	132	61.11
<i>Various attempts to tackle climate change</i>		
Totally disagree	5	2.31
Disagree	20	9.26
Agree	60	27.78
Totally agree	131	60.65
<i>Climate change is an unbreakable process</i>		
Totally disagree	13	6.02
Disagree	25	11.57
Agree	49	22.68
Totally agree	129	59.72
<i>Most of the increase in global temperatures since 1950 has been caused by human activity</i>		
Totally disagree	3	1.39
Disagree	13	6.02
Agree	67	31.02
Totally agree	133	61.57
<i>Climate change is caused by natural processes</i>		
Totally disagree	5	2.31
Disagree	14	6.48
Agree	68	31.48
Totally agree	129	59.72
<i>The average temperature of the Earth is determined by the greenhouse effect</i>		
Totally disagree	2	0.92
Disagree	19	8.80
Agree	56	25.92
Totally agree	139	64.35
<i>The United States is the second largest contributor to carbon dioxide (CO<sub>2</sub>) in our atmosphere</i>		
Totally disagree	2	0.92
Disagree	19	8.80
Agree	65	30.09
Totally agree	130	60.18
<i>Rainforest destruction is a major cause of carbon dioxide release</i>		
Totally disagree	1	0.46
Disagree	17	7.87
Agree	70	32.41
Totally agree	128	59.26
<i>Climate change evidence is convincing</i>		
Totally disagree	9	4.17
Disagree	22	10.18
Agree	60	27.78
Totally agree	125	57.87

**Table 2.** The climate change perception in the general frame-work among Private School Students

1. Perception of the important problem	N=122	%
International terrorism	15	18.59
Poverty, food and water scarcity	17	13.93
Increase of the elderly	21	17.21
Infectious disease	17	13.93
Global economic crisis	21	17.21
Global population growth	22	18.03
<i>Perception of the level of community seriousness towards the climate change issue, scaled between 1 to 10</i>		
10	15	12.29
5	4	3.28
1	0	0
<i>Perception of the level of respondent seriousness towards the climate change issue</i>		
10	21	17.21
5	1	0.82
1	0	0
2. Perceptions of the important problem		
<i>Various consequences of climate change</i>		
Totally disagree	6	4.92
Disagree	32	26.23
Agree	20	16.39
Totally agree	64	52.46
<i>Various attempts to tackle climate change</i>		
Totally disagree	10	8.20
Disagree	18	14.75
Agree	35	28.69
Totally agree	59	48.36
<i>Climate change is an unbreakable process</i>		
Totally disagree	6	4.92
Disagree	18	14.75
Agree	33	27.05
Totally agree	65	53.28
<i>Most of the increase in global temperatures since 1950 has been caused by human activity</i>		
Totally disagree	10	8.20
Disagree	13	10.65
Agree	43	35.24
Totally agree	56	45.90
<i>Climate change is caused by natural processes</i>		
Totally disagree	6	4.92
Disagree	19	15.57
Agree	35	28.69
Totally agree	62	50.82
<i>The average temperature of the Earth is determined by the greenhouse effect</i>		
Totally disagree	4	3.28
Disagree	20	16.39
Agree	35	28.69
Totally agree	63	51.64
<i>The United States is the second largest contributor to carbon dioxide (CO<sub>2</sub>) in our atmosphere</i>		
Totally disagree	8	6.56
Disagree	23	18.85
Agree	37	30.33
Totally agree	54	44.26
<i>Rainforest destruction is a major cause of carbon dioxide release</i>		
Totally disagree	2	1.64
Disagree	14	11.47
Agree	40	32.79
Totally agree	64	52.46
<i>Climate change evidence is convincing</i>		
Totally disagree	4	3.28
Disagree	21	17.21
Agree	45	36.88
Totally agree	52	42.62

**Table 3.** Hypothesis of the perception private and state school.

School	$\bar{x}$	Sd	P value	DF	E	T
State	60.49	1.81	< .00001	153.07	4.02	29.90
Private	49.09	3.96				

**Table 4.** Hypothesis of the health and environmental related problem

School	$\bar{x}$	Sd	P value	DF	E	T
State	90.16	2.93	< .00001	285.19	2.10	18.83
Private	84.33	2.51				

H<sub>1</sub>: There is significantly different from the perception regarding health and environmental related problem of both group of samples

According on Table 4, The observed standardized effect size is large (2.10). That indicates that the magnitude of the difference between the average and average is large. Sig is < .00001 which is less than 0.05 that rejects the main hypothesis (H<sub>0</sub>) and accept the secondary hypothesis (H<sub>1</sub>) which means that there is significantly different from the perception of both group of samples. As the result we can proof that student in state school have higher perception than private school.

When asking about the information source regarding climate change, both of respondents preferred to receive information via internet as primary sources, however private school students preferred to receive information via friend as secondary sources, while state school student preferred to receive secondary information sources from scientific article (Table 5 and Table 6).

**Table 5.** The source of information preference among State high school students

What is the source of information that you preferred to receive the most	N = 216	%
Family	12	5.55
Friend	19	8.80
Internet	107	49.53
Radio and Television	24	11.11
Newspaper	4	1.85
Scientific article	50	23.1

**Table 6.** The source of information preference among Private high school students

What is the source of information that you preferred to receive the most	N = 122	%
Family	9	9.84
Friend	27	22.13
Internet	52	42.62
Radio and Television	15	12.29
Newspaper	3	2.46
Scientific article	16	13.11

## 4 Discussion

Climate change and environmental perception is necessary to develop pro-environmental attitude for the society and youth are not only victims of climate change [16]. Adolescent are also valuable contributors to climate action to change the world. As the result, the world will be a better place [16, 17].

The research has determined and differentiated on how the perception of regarding climate change and health among private high school student and state high school are differed on one another in Thailand. Overall, it can conclude that most of participant at least concerned on the global warming and its health impacted to their life and society. The result on this research was different from research in Yogyakarta which identify that most of participants were less concerned on climate change and have low level of their understanding regarding health impacts. However, participants somewhat confused on some basic concept of climate change as they did not recognize that climate change is caused by anthropogenic factors [17, 18]. That is, it can be seen on the result of survey has shown that most of them believe "climate change is unbreakable process". Therefore, if compare to each group of participants, there is a slightly different on each group of participants, comparing to high schools, we can assume that state school students have higher perception than private school students. If asking about the information source preference regarding climate change, there is no significant difference on each group of participants as most of them preferred to receive information via Internet. This is, internet is the most accessible tools to access information at this era [19]. Nevertheless, Private high school students tended to receive information via friend rather than scientific article compared to State high school student. We assume that some student in Private school give more priorities to friendship. That is, friendship help children develop important life skills like getting along with other people and sorting out conflicts and problems [20].

## 5 Conclusion

Even though, majority of participants have high level of environmental consciousness regarding climate change, most of them somewhat lack of understanding on basic concept regarding climate change and its health impacted, which shown that education about the



climate change and global warming should be more concerned and improved. Otherwise, the consequences to environment will be immeasurable.

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