

The Impact of Social Media on Climate Change Perceptions: A Case Study of Indonesian Gen-Z

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Abstract. Climate change has become one of the most concerning issues in the 21st century. As it becomes a global problem, Indonesia can also feel the significant impact of climate change due to its geographical position. However, the Indonesian public's attention and awareness regarding climate change are low. One of the ways to spread awareness efficiently is through social media. Social media also has the ability to affect perceptions. Thus, it is important to understand Indonesia, specifically Gen-Z's characteristics. This study aims to analyze the impact of social media on climate change perceptions using perception indicators and based on geographical position (rural versus urban area). This research focuses on providing insights into how social media platforms can shape understanding and guidance in making environmental campaigns in Jakarta and Bogor. Therefore, this study uses a quantitative descriptive analysis methodology through a questionnaire to collect data. Using Google Forms, the survey was distributed for four days and acquired 400 Gen-Z participants between the ages of 15-23 living in either Jakarta or Bogor. The results of this study found that social media has a small impact on Indonesian Gen-Z climate change perception.

1 Introduction

Climate change has become one of the most concerning issues in the 21st century. Climate change occurs due to greenhouse gas emissions of heat trapped in the earth's atmosphere, in which will result in changes in weather patterns on a large scale. These emissions originate from natural systems and human activities. Therefore, weather patterns become more extreme and unpredictable [1]. Not only does it impact our physical environment, but it also impacts many aspects of our lives. Hence, an initiative is needed to consider in order to fight it [2]. As it becomes a global problem, Indonesia can also feel the significant impact of climate change due to its geographical position. However, the Indonesian public's attention and awareness regarding climate change are low. In Yogyakarta, one of the impacted cities in Indonesia, less than 15% of students in senior high school consider the issue as a very important problem. Similar to Jakarta and Bogor, Yogyakarta is also undergoing equivalent climate change impacts, such as rising temperatures that contribute to increased warmth, extreme climatic conditions in the city, and high rain intensity [3]. Additionally, based on research from Ika Idris as Associate Professor at Monash University Indonesia at a seminar on the Monash University Indonesia Campus, only around 27% of Indonesian people include the environment in their conversation [4]. In order to increase public awareness, effective environmental

communication is needed. One of which is to spread information using media, social media to be precise. People currently prefer to access new media such as social media to seek information. With billions of people using social media platforms, these platforms have become powerful tools for spreading information, shaping attitudes, and mobilizing action on climate change.

Social media has the potential to influence attitudes, beliefs, and behaviours. Every day, people broadcast messages on a wide range of topics such as politics, sports, health, news, technology, and many more every day. These messages can influence people that contain useful information for the detection or prediction of real-world phenomena, whether related to a global event or a local event. Furthermore, as more and more people use and spend their time communicating on social media, new communication rules are created and designed to interact on social media, and people are obliged to change the way they communicate, think, and behave in accordance with the context. Cultivation theory, proposed by Gerbner and Gross in 1976, stated that people who are exposed to media will see the world through the media's perspective [5]. According to the theory's premise, television and media have a small but significant effect on how society's perceptions and attitudes form. When people are exposed to the media frequently, their view of the "real world" reflects what they see, altering their actual reality into what they call "media reality" [6]. Despite its focus on television, the

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theory is still relevant to the new media, social media in particular. A study conducted by Ng argued that traditional media exposure has been surpassed by social media exposure, showing that social media has a greater impact than traditional media [7]. In addition, social media is also utilized as an amplifier for those who are more open about their beliefs and opinions, by Gen-Z to be precise. Based on research by the Pew Research Center, Gen-Z (Generation Z) has appeared as the group that is most engaged and vocal about issues in social media, one of which is climate change [8]. One of the examples is the proliferation and the rising number of Gen-Z-led non-governmental organizations in Indonesia, ranging in size from the small scale, run by high school students, to the largest, run by graduates such as Green Welfare Indonesia, Extinction Rebellion Indonesia, and numerous others. Although the majority of young people in Indonesia express their concern for the environment, there is still minimal action taken and being done [9]. However, while it can increase awareness and concern about the issue, it can expose social media users to misinformation and divide people's viewpoints. Due to the abundance of information available, people may find it difficult to distinguish which sources are credible and hoaxes. Users may be exposed to content on social media platforms that they favour or agree with, making the information they receive less objective and more biased as a consequence of the social media algorithm.

In advance, it is vital to take into account the drivers that support the perception itself, such as geography position (rural versus urban areas) in Indonesia. Jakarta is well known for its sensitivity to floods as an urban city and the capital city because of its geographical and climate situations [10]. High precipitation, progressively unpredictable patterns of precipitation during the rainy months, and a lack of open greenery space have all had an effect on citizens' activities and residences. The water outflow from Ciliwung upstream, located in Bogor, also impacted Jakarta's floods [11]. Bogor, as a rural area, is vulnerable to the negative effects of climate change which has been referred to as the Rain City experienced the driest month due to its unusual rainfall throughout the year [12]. In spite of that, Bogor is less dense than Jakarta. These geographical differences are one of the determinants of climate change perceptions such as direct and indirect experience related to weather events has emerged as one of the factors where individuals become aware of the various dangers of the environment related to climate change within their communities [13]. Despite the fact that much study has been conducted on perceptions of climate change, studies are often considered on a worldwide basis rather than within particular regions. Furthermore, earlier studies have primarily focused on developing nations rather than developed nations. Specific locations or provinces in Indonesia are rarely discussed and used as factors of climate change perception. Moreover, the impact of social media on youth climate change perspectives has proven challenging to find primarily in Indonesia, as the majority of research generally focused on agricultural aspects, making farmers and fishers the focus of the

research. The following shows the need for additional investigation of each region, both urban and rural, so that the government and organizations in Indonesia can more easily raise public awareness in accordance with population needs and effectively spread messages and information [14].

Thus, it is critical to undertake a study with the objective are to investigate the impact of social media use on climate change perception among Gen-Z in Indonesia based on where they are located or the environment around them. Likewise, the impact of climate change perception on their choice and behaviour will be looked into, as this is critical in terms of climate change mitigation. The research questions are as follow:

RQ1. Does social media able to impact Gen-Z's climate change perceptions based on geographical location (Jakarta as rural versus Bogor as urban area)?

RQ2. How significant is the impact of social media toward climate change perceptions?

2 Literature review

2.1 Climate change perceptions: Drivers and factors

How we perceive climate change can affect how we respond to the climate crisis, both individual and societal [15]. Not only that, but public perception of climate change can also be a potential or threat to the implementation of climate policies. Considering this, it is critically important to comprehend how perceptions are formed in advance, given their importance in establishing an effective climate change mitigation approach. Referring to Ruiz's study, perceptions are formed due to direct and indirect influences. Directly, perceptions are affected by a variety of components such as shared views and values within a society, personal experiences, education, awareness of scientific studies, exposure to media, and even corporate influence. Indirect influences are proven to have a correlation with the community's degree of growth and development, the level of interaction between people, and the distribution of climate change information [16].

Another study, however, reveals different viewpoints on perception factors. People's internal beliefs about the world being flexible and versatile, as opposed to permanent and unchangeable, may significantly influence their environmental attitudes and behaviours [17]. Nonetheless, the study found that those with both development and fixed mindsets about the world exhibited various attitudes regarding climate change as well as diverse behavioural preferences. Demographics such as age, gender, and education, are also as important as other determinants [18]. Some demographic effects are determined by the distinctive characteristics of the area/region. According to a study by Bohm, demography in Northern Europe contributes to climate change perceptions/beliefs more than in Western European countries [19]. In the context of gender, a study by Whitmarsh in the United Kingdom revealed that women are less sceptical of climate change than men [20].

2.2 Social media and youth

Social media, which emerged in the 2000s, has revolutionized the media industry, leading to significant transformations in existing theories and media practices. Numerous industries have swiftly adapted to these changes. Moreover, the number of internet users has been rapidly increasing across all genders and age groups. Gen-Z holds the majority of social media usage in Indonesia, where there are approximately 160 million users of digital media platforms such as YouTube, WhatsApp, Facebook, Instagram, and Twitter [21]. New social media-driven phenomena like influencer lifestyle and culture, trending challenges, and social action campaigns have emerged as a result of Gen-Z's interest in social media. Greta Thunberg, a young climate activist, has captivated the attention of the entire world [22]. She merely raises awareness about the critical issues of climate change and climate crisis, but she also inspires her audience to take action through her social media platforms, mainly Twitter. Although social media usage can be very useful in raising awareness, social media is also famously used for promoting behavioural change on environmental values [23]. Ever since her school strike went viral and became a worldwide phenomenon, an estimated 1.6 million students from over 120 countries joined the school strike for the climate. Due to her rapid popularity and her ability to influence, people called it the "Greta effect" [24]. Indonesia, in particular, is also affected by Greta's movement. Hundreds to thousands of elementary school-aged children to college students, and even students from a number of Islamic boarding schools took part in taking to the streets to carry out climate action while at the same time inviting adults to act in response to Greta Thunberg's call for a Global Strike for Climate [25]. This social phenomenon proves how influential social media is in the hands of youth, specifically Gen-Z. The capacity to instantly exchange information, connect with others who share similar interests, shape public opinion and conversation, and mobilize effective protests and campaigns are valuable aspects of using social media. Referring to Iacomini's study, they stated that this social phenomenon created polarization in social media [26], which could lead to widespread misinformation or hoaxes [27]. Despite their familiarity with social media, Generation Z is a vulnerable generation. They can easily be persuaded and affected by fake news [28]. On the contrary, a research found that this statement is potentially false, stating that there are some Gen-Z that tend to evaluate the truth of information first and reject messages deemed unnecessary [29].

Due to these, social media holds a powerful place in terms of mobilising action and shaping perceptions among Gen-Z. Based on the study conducted by Gerbner and Gross in 1976, media consumption affects how perceptions, beliefs, and perceptions are shaped. It can cultivate some commonly held beliefs about reality among media audiences. Initially, the theory was based solely on the subject of violence on television and how the content they saw gave them impressions of violence such as more fear, higher anxiety after viewing

television messaging, and so on. This theory divides television viewers into two types: heavy watchers and light viewers. Heavy viewers are those who watch more than 4 hours of television every day. Meanwhile, light viewers are those that watch for less than 2 hours every day. In the theory, Gerbner argued that television is a mass media that is fundamentally distinct from the others, television impacts how people think and relate, and television has limited influence. Television is multimedia in which the audience or users are not required to read, is a combination of audio and video, and is accessible at any time. Television can additionally bring people together or bring people from various backgrounds together by giving them the same experience despite of their differences. However, television still had little impact. Gerbner and his colleagues claim that it is not a case of watching a specific television program producing certain behaviour, but rather that television viewing, in general, has an accumulated and pervasive impact on how we view the world [30]. Although this theory solely focuses on traditional mass media, specifically television, the association between this theory and new media is thought to be considerable. Previously, cultivation theory had been studied and it was discovered that heavy viewers on social media had more concerns [31]. Furthermore, the nature of social media fulfils the fundamental assumptions of this theory. Social media is considered a unique media since users can accomplish so much in one spot, such as a blend of music, video, literacy, and engagement. Not only as audiences, but users can also participate as creators or message distributors without the need for advanced technology. Due to the algorithm, social media can also impact how individuals think, distorting public opinion [32]. Nonetheless, the impact of social media is regarded as small. A study found that as "loud" as Gen-Z is on social media, the activities they carry out after seeing social media are still relatively insignificant [33]. The coherence of the following assumptions may turn social media into a new medium for cultivation theory. However, because users can communicate directly with other users anonymously, such as *like*, *comment*, *follow*, *subscribe*, and so on, further in-depth research is required as a current reference for this theory.

3 Methods

Given the aim is to analyse the impact of social media on climate change perceptions based on geographical location as one of the determinants, this study intends to implement a quantitative methodology with a descriptive approach using a survey questionnaire. The quantitative method helps in the observation of situations or events that have an impact on people. Quantitative research generates objective data that may be confirmed properly using statistics. A descriptive technique ensures more objectivity and reliability by addressing the subject matter at hand while being guided by prior studies. The survey is distributed from May 6th to May 9th with a time span of 4 days and acquires 400 Gen-Z participants between the ages of 15 and 23 who

live in Jakarta or Bogor using Google Forms. The reason for selecting a specific age is due to the fact that may be too young or too mature, acknowledging the age range of Gen-Z itself is 1997 - 2010. Giving respondents four days to finish the survey ensures that they have enough time to fill out the questionnaire. Given that people have different agendas that can hinder responses within seconds, this more extended duration enhances the possibility of gaining a more accurate response rate. Extending the survey time also helps to reduce biased responses. When a questionnaire is only open for a short period, it tends to attract mainly those who are immediately available or strongly motivated to participate. By extending it, a wider range of respondents can participate, lowering the possibility of bias in the findings. Participants were selected using a quota sampling method from each domicile's total population. The rationale for using the quota sampling approach to choose research participants is that it seeks to replicate, within the sample, the specific characteristics that the researcher considers necessary for representation and enable generalization to a larger population. It is necessary to underline that the sampling population, in this case, was chosen based on the perception determinant theory of Ruiz's study.

The data collection technique for this research used a Google Form with answer statements in the form of a Likert Scale from Strongly Disagree (1) to Strongly Agree (5). As to the data strategy analysis, the validity of the data is measured using a construct validity test to examine the data to see how accurate they are and how well they fit with existing theory. Furthermore, the data are analysed using univariate analysis, especially using frequency distribution, to analyse the data and use the SPSS (Statistical Package for The Social Science) application version 27 in its implementation. Univariate analysis is a statistical analysis that describes only one variable. Univariate analysis has the goal of explaining or describing the characteristics of each research variable, which in its analysis produces a distribution of frequencies and percentages of each variable [33]. The reason underlying the choice of univariate analysis technique is partly because there is only one variable in this study, namely perception. In addition, because the function of the univariate analysis itself is useful for summarizing the resultant data set from measurements, so that the data can be processed into useful information. First, make a frequency analysis to make a frequency distribution so that the data is easier to process and read. Then, look for and calculate the mean of all data such as the mean of each statement item in the questionnaire per sampling city, namely Jakarta and Bogor in order to get a conclusion on whether domicile/place of residence can affect perceptions of climate change after viewing social media information. Then, calculate the mode as well as the median value, followed by the Z score between instruments of climate change perception from each region – Jakarta and Bogor. In order to accurately analyse the data, the chi-square test and independent sample t-test are also used to examine the relationship between hypotheses. Moreover, crosstabs analysis using SPSS is also required in order to compare the differences between two targeted regions and to

investigate the correlation between each indicator and statement with respondents' region/domicile. The hypotheses are as follows:

Ho : There are no significant impact of social media on climate change perceptions.

Ha : There are significant impact of social media on climate change perceptions.

4 Result

Our outcome shows that the instruments and indicators of relative variables are able to influence climate change perception in Jakarta and Bogor after accessing social media. Univariate analysis using the frequency distribution and Z score shows that for the people of Bogor, social media has an impact on climate change perceptions derived from the four dimensions or indicators. This is evidenced by the average value of each indicator. From Bogor, Table 1 shows that variable dimension 1, namely awareness about climate change after seeing information from social media, has a relative value of 4 (agree). Table 2 shows that variable dimension 2, namely opinion or personal view of the place of residence on climate change, is worth 4. Table 3 shows that variable dimension 3, namely knowledge obtained after viewing social media, is worth 4. Table 4 shows that variable dimension 4, namely attitude/action taken because of social media, tends to have a value of 4. For Jakarta, Table 5 shows that variable dimension 1 has a relative value of 4. Table 6 shows that variable dimension 2 has a value of 4. Table 7 shows that variable dimension 3 has a relative value of 4. Table 8 shows that variable dimension 4 has a value of 4.

Table 1. Mean and standard deviation result from Bogor's awareness of climate change indicator.

	N	Mean	Std. Deviation
X1	200	4.19	.804
X2	200	4.24	.814
X3	200	4.16	.809
X4	200	3.74	1.162
X5	200	4.03	.995
X6	200	4.07	.959
X7	200	3.96	1.014
X8	200	4.23	.779
Valid N (listwise)	200		

Table 2. Mean and standard deviation result from Bogor's perception/personal opinion on climate change indicator.

	N	Mean	Std. Deviation
X1	200	4.07	.804
X2	200	4.24	.814
X3	200	4.19	.809
X4	200	4.17	1.162
Valid N (listwise)	200		

Table 3. Mean and standard deviation result from Bogor ‘s attitude/actions likely taken after social media indicator.

	N	Mean	Std. Deviation
X1	200	4.07	.959
X2	200	4.24	.852
X3	200	4.19	.746
X4	200	4.21	.804
Valid N (listwise)	200		

Table 4. Mean and standard deviation result from Bogor’s knowledge about climate change indicator.

	N	Mean	Std. Deviation
X1	200	3.75	1.190
X2	200	4.06	.903
X3	200	4.32	.794
X4	200	4.38	.721
Valid N (listwise)	200		

Table 5. Mean and standard deviation result from Jakarta’s awareness of climate change indicator.

	N	Mean	Std. Deviation
X1	200	4.09	.963
X2	200	4.09	.873
X3	200	4.11	.855
X4	200	3.83	1.055
X5	200	3.86	1.117
X6	200	3.95	1.055
X7	200	3.88	.860
X8	200	4.14	.777
Valid N (listwise)	200		

Table 6. Mean and standard deviation result from Jakarta’s perception/personal opinion on climate change indicator.

	N	Mean	Std. Deviation
X1	200	4.09	.884
X2	200	4.37	.698
X3	200	4.09	.858
X4	200	3.95	.876
Valid N (listwise)	200		

Table 7. Mean and standard deviation result from Jakarta’s attitude/actions likely taken after social media indicator.

	N	Mean	Std. Deviation
X1	200	4.29	.754
X2	200	3.80	1.140
X3	200	4.21	.767

X4	200	3.44	1.259
Valid N (listwise)	200		

Table 8. Mean and standard deviation result from Jakarta’s knowledge about climate change indicator.

	N	Mean	Std. Deviation
X1	200	3.81	1.074
X2	200	4.11	.870
X3	200	4.28	.753
X4	200	4.23	.805
Valid N (listwise)	200		

Furthermore, the chi-square test shown from Table 9 was used to support the validity of the study's hypothesis. Asymp. sig. value 0.137, the null hypothesis is accepted while the alternative hypothesis is rejected. The difference test of 0.206 and the Sig. (2-tailed) from the independent sample t-test in Table 10 also support this. As a comparison in perceptions differences, according to crosstabs analysis, Gen-Z that lives in Jakarta are most likely to agree to strongly agree in each indicator. For Bogor as an urban area, Gen-Z also agreed to strongly agree from each statement in each indicator. These are proven by the highest number in the range scale of 4 to 5 and above 45%.

Table 9. Chi-square test result from both region, Jakarta and Bogor.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.981	2	.137
Likelihood Ratio	3.990	2	.136
Linear-by-Linear Association	.208	1	.649
N of Valid Cases	400		

Table 10. Independent sample t-test result from Jakarta and Bogor.

	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower
Equal variances assumed	.206	-.0165	.0485	-.1569
Equal variances not assumed	.206	-.0165	.0485	-.1569

5 Discussion

According to the survey results, Gen-Z in both Jakarta and Bogor primarily used Instagram as their primary social media platform. Then followed by Whatsapp,

TikTok, Twitter, Youtube, Telegram, and finally Facebook. Not only that, but they spend an average of 4 to 6 hours per day on social media. The majority of them spend 4 to 6 hours in the Jakarta area. They also spend 4 to 6 hours in the Bogor area. The results of the average value of the answers to each statement, the dimensions/indicator variables of climate change perceptions are affected after social media access among Gen-Z. According to data from the Bogor area, dimension 1 variable shows that awareness gained from social media has an influence on perceptions of climate change because the respondents who answered agreed. The variable dimension 2 also shows the influence of personal opinions or personal views on climate change based on what they experience in their area of residence. Likewise, variable dimension 3 shows the respondents' agreement with the influence of social media on the attitude they will take after receiving information about climate change. Variable dimension 4 also tends to prove that knowledge gained from social media can shape our opinion about the impacts and risks of climate change. Jakarta also proves that the dimensions of the climate change perception variable have an influence.

In the case of Jakarta, the data reveals that Gen-Z expresses agreement relatively in several aspects. They acknowledge that social media plays a significant role in increasing their awareness about climate change. They also recognize that their personal experiences in the region influence their perspectives on climate change perceptions. Additionally, they acknowledge that social media contributes to their knowledge and shapes their opinions regarding the impacts and risks associated with climate change. In spite of that, there are no huge opinion differences between Jakarta and Bogor in terms of the effect of social media on their climate change perceptions. Each area reveals that there are no significant differences, according to the data from crosstabs analysis. Jakarta, as a rural area, shows that above 45% average of Gen-Z agreed to strongly agreed that their perceptions and knowledge are impacted by their social media usage. Whilst Gen-Z in Bogor, as an urban area, are most likely to agree to strongly agree that social media effect on how they perceive and how they expand their knowledge regarding climate change, proven by its percentage values above 48% average. Furthermore, this study also found that there is a small amount of social media's impact on climate change perceptions, proven by the chi-square test that reveals the accepted null hypothesis and rejected the alternative hypothesis. These findings imply that what Gerbner and Gross claimed in their cultivation theory remains true despite the fact that the influence is minimal. In one of the questionnaire statements, respondents from Jakarta and Bogor are more likely to agree that they frequently read information about climate change on social media platforms that they use frequently and believe that Indonesia's climate has changed. This frequency demonstrates that the more often respondents are exposed to climate change issue on social media, the more they believe climate change is actual and an important issue. Although the data analysis shows that region/domicile has no significant impact, the frequent

use of social media corresponds with the average response from respondents.

6 Conclusion

These past few years climate change has become a serious issue that affects a lot of life aspects of an individual. In spite of the fact of its seriousness, people, specifically Gen-Z, has low awareness regarding this topic. In social media, Gen-Z has become one of the most vocal generations. Proven by a growing number of non-governmental organizations in social media made by youth, social media has the ability to affect others. Social media has the potential to influence attitudes, beliefs, and behaviours. Every day, people broadcast millions of messages on a wide range of topics such as politics, sports, health, news, technology, and many more. One of the examples is the existence and presence of Greta Thunberg on Twitter and Instagram. After her Friday school strike for the climate went viral, Greta Thunberg inspired an estimated 1.6 million students from 120 countries to join the movement, including Indonesia. This widespread impact became known as the "Greta effect," demonstrating the influential power of social media in the hands of Gen-Z. In Indonesia, a significant number of elementary school students, college students, and even students from Islamic boarding schools have actively participated in street demonstrations to promote climate action. Their involvement has not only raised awareness about the urgency of addressing climate change but has also served as an invitation for adults to join the cause.

In accordance with the findings of this investigation, social media can influence how people think of climate change among Gen-Z in both Jakarta and Bogor. Moreover, the majority of them spend 4 to 6 hours per day on social media. Consequently, the average of their responses showed a range of 3 to 4, which on the Likert scale signifies hesitant to agree. The findings suggest that the social media Gen-Z regularly use affects how they create their perceptions of climate change in both rural and urban areas. Nevertheless, the result of the data analysis indicates that there is no huge impact of social media on climate change perceptions, as previously stated in the cultivation theory. Furthermore, there are no significant perception differences between both Jakarta and Bogor. This indicates that whether the urban or rural area, it doesn't affect Gen-Z's perceptions regarding climate change as the impact of their social media usage. Hence, further research should consider various factors other than social media in order to create suitable guidance for environmental campaigns according to each region in Indonesia.

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