Perception of Climate Change and Settlement Density as the Cause of Flooding in Bungurasih Waru Sidoarjo

Nugroho Hari Purnomo[1][a], Muzayanah [1][b], Mohd Azmeer Abu Bakar[1], Lidya Lestari Sitohang[2], Aida Kurniawati[1], Dian Ayu Larasati[1], Ita Mardiani Zein[1] and Eko Budiyanto[1]

[1]*Geography Education, Universitas Negeri Surabaya, Ketintang, Surabaya, Indonesia*
[2]*School of Humanities, Universiti Sains Malaysia*

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Abstract: This study focuses on the high risk of flooding in Waru Village, Sidoarjo, caused by the overflow of the Buntung River, Sidoarjo. This condition is exacerbated by climate change and housing density. This study aims to analyze public perceptions related to climate change, hot temperatures and land development as contributors to flooding. This study is an urgent need to increase public awareness of disaster risks, especially those related to flooding and is important for disaster mitigation and adaptation. This study contributes to the academic field by filling the gap in understanding how public perceptions of climate change relate to everyday life experiences, especially flooding and hot temperatures. The results of the study indicate that the flooding experienced by the Bungurasih Village community in Sidoarjo formed a high public perception of the statement that climate change causes natural disasters, one of which is flooding. The community has a high perception that one of the causes of flooding is land development, which worsens flood conditions.

1 INTRODUCTION

Climate change has a global impact, affecting various aspects of the environment in both urban and rural areas. In urban areas, climate change increases the urban heat island phenomenon, which is an increase in temperature in densely populated areas due to reduced green space and changes in land use (Lasaiba, 2022). Meanwhile, in rural areas, climate change is often associated with increasing levels of poverty (Sunito, et al., 2019). Coastal communities face the threat of rising sea levels that slow water flow, causing a higher risk of flooding for urban residents with dense and irregular settlements (Ulfa, 2018). Climate change has a direct impact on the urban poor, who are characterized by dense and irregular settlements that respond to high rainfall and cause flooding (Adib, 2014).

Views on climate change vary widely across different levels of society. Elite groups, such as scientists, educated people, and policy makers, tend to understand climate change as changes in the pattern and intensity of climate elements compared over a certain period of time, usually 30 years. In contrast, the general public more often associates climate change with changes in land use and natural phenomena that they experience directly, such as floods and droughts (Aldrian, E. Karmini, M. Budiman, 2011). Community understanding of climate change is influenced by their real experiences of the impacts of disasters in their environment, in contrast to scientific understanding which is more abstract and comprehensive (Handoko, et al., 2018). In his study of the impacts of climate change from a community perspective, Handoko conducted an analysis of community perceptions of climate change by considering aspects of community exposure to floods and droughts in their daily lives. In other words, understanding of climate change has different characteristics where at the elite level the emphasis is on comprehensive insight, while climate change at the community level is a concrete experience of disasters in the environment in which they live.

Recent observations indicate that the impacts of climate change are becoming more frequent and

[a] https://orcid.org/0000-0003-4404-5318
[b] https://orcid.org/0000-0001-7848-4605

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extreme, increasing the need for community resilience to disasters. However, communities are often reluctant to adapt or mitigate if they are not provided with adequate information about the impacts of climate change (Gemeda, et al. 2023). Perceptions and beliefs about climate change play an important role in driving the adaptation process that will be carried out by communities (Cohen, et al. 2019). Boon-Falleur, 2022, emphasizes the importance of social cognitive mechanisms, such as norms, reputation, and justice, in building effective climate change awareness (Boon-Falleur, et al., 2022). The way relationships between humans work can be viewed from three social cognitive mechanisms, namely norms, reputation management, and justice calculations. The relationship between the three will determine effective mitigation.

This also occurs in several regions in Indonesia. Previous research by Handoko, et al in Batanghari village showed that community perception of the phenomenon of climate change is understood in relation to changes in land use. Their understanding of climate change is associated with flooding and drought events (Handoko, et al, 2018). The results of this study are interesting because the idea of climate change that is discussed massively and widely by elites is understood using direct experience by the community. However, there are limitations in this study, namely that it does not specifically discuss community perceptions of climate change using temperature parameters. This is important considering that the issue of climate change is understood using generalizations of numerical data or without including a description of in-depth insight into how climate change occurs when narrated. This research proposal aims to fill this gap.

Several studies have been conducted by other researchers to analyze the community aspect in dealing with flood disasters. The studies consist of identifying the level of flood hazard (Bertilsson et al., 2019), characterizing the flood resilience of urban communities (Fristyananda & Idajati. 2017), increasing community resilience to floods (Auladi, et al, 2022). In general, community and stakeholder aspects are linked to adaptation and mitigation of flood disasters (Bakar, et al, 2018; Isa et al., 2013). Based on this background, the formulation of the problem in this study is how is the level of community perception of climate change and land development that causes flooding in Bungurasih Waru Sidoarjo?

There has not been much literature on the parameters of land development and flooding in analyzing the impact of climate change. Most of the literature related to community and stakeholder aspects is linked to adaptation and mitigation of flood disasters ((Bakar, et al, 2018; Isa et al., 2013). The advantage of the study developed in this study is the regional context, specifically the peri-urban area in linking climate change, flooding, land changes and community perception.

2 METHOD

This study was conducted in Waru Village, Waru District, Sidoarjo Regency, with a population living in a densely populated area close to industrial areas, provincial bus terminals, and various business services. These conditions make the community vulnerable to flooding, and previous flood experiences play a role in shaping their resilience.

This study uses a descriptive method to provide an overview of community perceptions regarding climate change and land development as causes of flooding. A survey approach was used to collect data from a sample of individuals representing the village population. The survey was conducted by filling out a questionnaire by respondents with researcher guidance and researcher observations at the flood location.

The study population was heads of families living in Waru Village, with adult family members selected as representatives. The number of samples was 30% of the entire population, resulting in 48 respondents. The sample selection used proportional and incidental sampling techniques so that the representation of respondents was evenly distributed throughout Waru Village, Sidoarjo.

The primary data collected included the characteristics of respondents and their perceptions of climate change and land development factors that were considered to cause flooding. Each perception was analyzed quantitatively with a Likert scale to obtain interpretations based on low, medium, or high categories.

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1. Education
2. Occupation
3. Information on disasters and climate change
   a. Source of information on the term climate change
   b. The word climate change

4. Perceptions related to climate change events (Likert), with the questions:
   a. Increased daily temperatures
   b. Heavy rain events
   c. Tornado events
   d. Dengue fever events
5. Perception that climate change causes hot temperatures (Likert), with the questions:
   a. The increase in industrial buildings pollutes the air so that rain becomes heavier
   b. The density of motor vehicles pollutes the air so that rain becomes heavier
   c. From year to year, the rainfall that occurs is getting heavier
   d. Sea level rise at the mouth of Kali Buntung, so that water does not flow quickly to the sea
6. Perception that land development is the cause of flooding (Likert), with questions
   a. The addition of buildings causes water not to seep into the ground
   b. The addition of buildings causes drainage to become narrow
   c. The addition of buildings causes shallowing and blockage of river flow
   d. The addition of buildings without considering drainage aspects

The Likert scale used is (1) strongly disagree; (2) disagree; (3) doubtful; (4) agree and (5) strongly agree. Each perception is divided into 5 interpretation criteria scores, namely: (1) Weak: 0 - 33%; (2) Medium: 34% - 67%; (3) Strong: 68% - 100%.

3 RESULT AND DISCUSSION

3.1 Respondent Profile

The age range of respondents in this study ranged from 21 to 80 years, with an average age of 51 years. Most respondents were graduates of SMA/SMK/MAN or equivalent (54%), while 13% had a bachelor's degree. The composition of respondents' jobs varied; as many as 29% were unemployed and depended on support from their working children, while the rest worked as laborers, self-employed, employees, and others, as presented in Figure 1.

The respondents' jobs are quite diverse with the composition as presented in Figure 2. As many as 29% of respondents do not work, they rely on their children who work to support themselves.

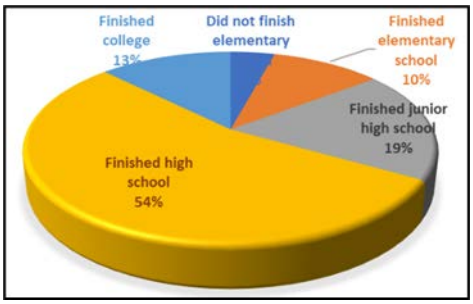

Figure 1: Respondent's education level.

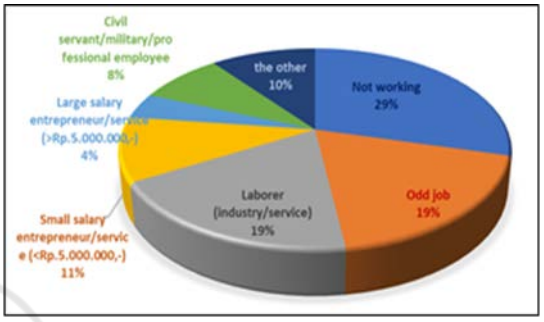

Figure 2: Respondent's job.

3.2 Disaster and Climate Change Information

3.2.1 Floods

Most respondents in Bungurasih Village, Sidoarjo have experienced floods. From the survey results, only 1 respondent reported not experiencing flooding because the floor height of his house was higher than other houses. As many as 94% of respondents experienced flooding with varying levels of inundation; 44% stated that they experienced moderate inundation, and 42% experienced low inundation, as presented in Figure 3 below.

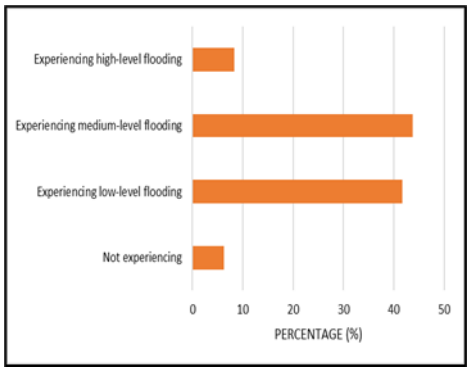

Figure 3: Flood incident.

3.2.2 the Term “Climate Change”

A total of 84.5% of respondents have heard the term "climate change." The majority get information from social media such as YouTube, television, and messaging applications (52%), while 16.7% from other social media such as Facebook and Instagram. This is in line with Anderson's research (2017), which states that social media makes it easier for people to access the latest information related to climate change from various trusted sources, including scientists and environmental journalists (Anderson, 2017).

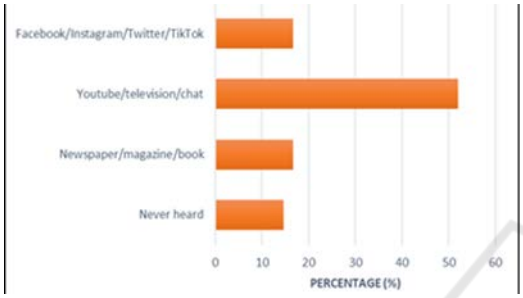

Figure 4: Respondents' perceptions regarding the term ‘‘climate change” and sources of information.

One of the issues spread by social media is climate change. Social media helps increase public knowledge about climate change by providing factual and scientifically based information that is easily accessible (Anderson, 2017). This visual content tends to be more effective in arousing emotions and raising awareness than text alone. Through engaging visualizations and narratives, social media has succeeded in strengthening public perception that climate change is an urgent problem that requires immediate action (Leiserowitz, et al,. 2020).

3.2.3 Public Perception of Disasters That Occur with Climate Change

The results of the public perception survey on disaster events with climate change are presented in Figure 5 below:

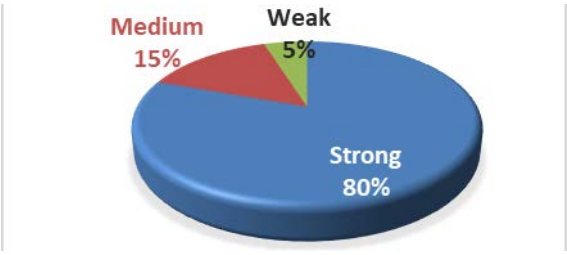

Figure 5: Respondents' perceptions of disasters caused by climate change.

The results of the study showed that public perception of climate change as a cause of disasters is quite high. Around 80% of respondents have a strong perception that climate change has a direct impact on disasters, especially floods. This finding is in line with Nurhayati, et al., 2020. which revealed that although public understanding of climate change is still limited, they are aware of its impact on daily life. Communities who feel the impact of climate change are usually people who depend on natural conditions for their livelihoods, such as farmers. Some people understand that climate change that has occurred over the past few decades is caused by human activities. The level of public perception and knowledge influences the strategies used to deal with the negative impacts of climate change.

3.2.4 Public Perception That Climate Change Is the Cause of Flooding

Public perception of the statement that climate change is the cause of flooding is presented in Figure 6 below:

Figure 6: Respondents' perception that climate change is a cause of flooding.

The results of the study showed that respondents' perceptions of climate change as a cause of flooding were high, 70%. People who had medium perceptions were 20% and people who had low perceptions were 10%. With a maximum score of 144, the score obtained was 111, so the average score percentage was 77.10%. This value is included in the Strengh score.

The results of this study are supported by the direct experience of the Bungurasih Sidoarjo village community with the flood disaster. Floods play a major role in shaping people's perceptions of climate change. Studies show that people who have experienced disasters tend to believe more in the relationship between the disaster and climate change, compared to those who have not had similar experiences (Spence, et al., 2011). When people experience the direct impact of this extreme event, they find it easier to understand the actual impact of climate change.

3.2.5 Public Perception That Land Development Is a Cause of Flooding

The public perception that land development is a cause of flooding is presented in Figure 7 below:

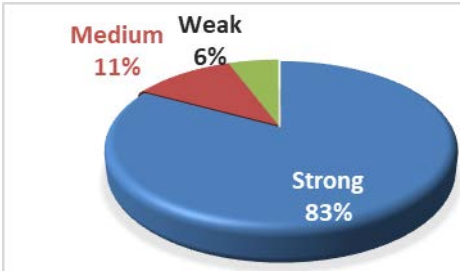

Figure 7: Respondents' perception that land development is a cause of flooding.

The tabulation results show that respondents' perceptions of land development as a cause of high flooding are 83%. Medium perception is 11% and low perception is 6%. With a maximum score of 144 and a score of 123, the average score percentage is 85.42%. This value is included in the Strength score.

Most respondents (83%) have a high perception that land development worsens the risk of flooding. When green spaces and open land are converted into commercial or residential buildings, the soil's ability to absorb rainwater is drastically reduced, increasing the potential for flooding. This perception is supported by the direct experience of people living in flood-prone areas, as well as previous studies showing a link between land development and high flood risk in urban areas (Wang, et al., 2018; Jha, et al., 2012).

In the urban context, public perceptions of flooding are often related to the inability of drainage infrastructure to accommodate increased water flow due to land development. A study by Jha, et al., 2012., noted that people in large cities such as Jakarta and Bangkok realized that drainage systems that were not in accordance with capacity were the main cause of flooding. They also mentioned that building construction that reduces the water percolation area increases the burden on the drainage system, causing flooding in the rainy season.

In addition, public perception of land development as a cause of flooding is often reinforced by the socio-economic impacts caused by flooding. When flooding causes major losses to residents, both in terms of economy and social life, people tend to be more critical of development policies that do not pay attention to environmental impacts. Research by Samwinga, 2009, found that the perception of flood risk and losses experienced by urban communities increased their awareness of the importance of maintaining water catchment areas and supporting environmentally friendly development.

The study of community perceptions of flood disasters is important in determining their support for adaptation policies taken by the government. Communities tend to be more supportive of government policies aimed at increasing resilience to climate risks, if they believe that climate change will have a serious impact on their lives. In other words, a strong perception of the urgency of climate change can lead communities to encourage collective action, support and actively participate in policies related to climate mitigation and adaptation [23]. This is evidenced by the active participation of the Waru Village community in assisting the East Java Public Works and Water Resources Agency (PU-SDA) during the normalization of the Kali Buntung River which was carried out in early 2024. The community also helped clean up garbage and water hyacinth along the Kali Buntung River, Waru Bungurasih Village.

4 CONCLUSIONS

The results of this study indicate that the community in Bungurasih Village, Sidoarjo, has a strong perception that climate change plays an important role in increasing the risk of flooding. High public perception of the importance of climate change and its impacts can encourage collective action to support government policies in climate change mitigation and adaptation. With increasing public awareness of the dangers of climate change, it is hoped that the community will be more proactive in supporting sustainable environmental policies. Further research is needed related to perceptions, knowledge and community participation in areas experiencing flooding, so that there is learning from one area to another.

5 RESEARCH LIMITATIONS

Based on the researcher's direct experience in this research process, there are limitations that are experienced and need to be considered by future researchers in perfecting the research results. Some limitations in this study are:

1. The number of respondents is 48 people, of course it is still not enough to describe the real perception of the community.

2. This study has not examined community knowledge about flood mitigation and adaptation. This study is useful for providing suggestions or programs to improve community understanding and readiness in dealing with floods at the research location.

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