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The Level of Student Preparedness to Facing Flood Disasters at SMA Negeri 1 Perhentian Raja Kampar Regency, Riau Province

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Abstract: Floods are one of the natural disasters that often occur in Indonesia, including in Riau Province. Kampar Regency, especially the Perhentian Raja area, is one of the areas prone to flood disasters. Caused by the morphological and physical conditions of the area which is dominated by lowlands and surrounded by large rivers such as the Kampar and Siak rivers and other rivers in Kampar Regency. This research aims to, 1) Knowing the impact of the flood disaster at SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province. 2) Analyzing the level of preparedness of students facing flood disasters at SMA Negeri 1 Perhetian Raja, Kampar Regency, Riau Province, 3) Formulating a strategy for developing students' preparedness for flood disasters at SMA Negeri 1 Perhentian Raja. This research was conducted using mixed research (Mix Methods) with quantitative and qualitative approaches, and using the AHP method (analytical Hierarchy Proces) to formulate strategies for developing student preparedness. Data collection using interviews, questionnaires, FGD (Focus group discussion), and analysis. The research results show that 1) The impact of the flood disaster at SMA Negeri 1 Perhentian Raja showed a light impact on the physical and environmental aspects of the school. 2) The level of preparedness of students in facing flood disasters at SMA Negeri 1 Perhentian Raja was obtained using 5 parameters. The total number of parameters entered the average index of 86.4% in the very prepared category. 3) The strategy for developing students' preparedness to face flood disasters at SMA Negeri 1 Stop Raja uses the method Analytical hierarchy proces got 9 alternatives. This alternative was formulated to reduce the risk of flood disasters at SMA Negeri 1 Perhentian Raja.

Keywords: Flood disaster; Preparedness; Riau; Students

Introduction

The Indonesia is included in the ranks of countries that have high risk and vulnerability to natural disasters (Aksa & Afrian, 2022; Caporale & Rinaldi, 2025; Dodon, 2013; Erlia et al., 2017; Garschagen et al., 2021). This condition is caused by various aspects, especially the geographical position of this country (Aguilar-Farias et al., 2020; Nyoman et al., 2024; Selviani et al., 2023). Located along the equator, Indonesia has a very varied natural landscape (Alvarez et al., 2023; Padli et al., 2024; Prasetyo et al., 2024). In addition, from a geological point of view, the country is at the meeting point of three very active major tectonic plates. The combination of these factors makes Indonesia a region vulnerable to various types of natural disasters (Pawiranata & Setiawan, 2023). In 2024 according to the report of the national disaster management agency (BNPB), there were 27 natural disasters in Indonesia during the period 19-25 February 2024. Disaster the most common occurrence was flooding, namely 16 incidents or 59% of the total disasters in that period (Ningrum & Ginting, 2020; Taryono & Iyan, 2022).

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A flood disaster is an event or series of events that threatens and disrupts people's lives (Kalita et al., 2025; Mahamba et al., 2025; Maharjan et al., 2025; Wu et al., 2025). Floods are caused by overflowing river water caused by natural factors, including damage to upstream watershed buffer areas. This condition results in casualties, environmental damage, property loss and significant psychological impacts (Hermon et al., 2024; Padli et al., 2024). Disaster is a sign of human life that cannot be known exactly when it occurs, humans are only able to recognize the initial symptoms (Lv et al., 2025; Maharjan et al., 2025; Tian et al., 2025). One of the efforts to reduce and avoid the impact of disasters is disaster preparedness (Dodon, 2013; Erlia et al., 2017). Preparedness includes all activities carried out before a disaster occurs, with the aim of increasing operational capacity and facilitating an effective response when a disaster occurs (Prasetyo et al., 2024; Sari et al., 2023; Selviani et al., 2024). Preparedness is carried out to determine fast and appropriate ways to deal with disasters. This is done by training emergency response mechanisms to reduce the impact of disasters (Hermon, 2023; Selviani et al., 2024). Disasters can affect the world of education, the impact of damage to schools due to disasters, such as teachers and students, teaching and learning processes, infrastructure and maintenance services, has threatened the future of millions of children. Disruption of education due to natural disasters is the main reason why children and teenagers drop out of school (Péreznieto & Harding, 2013; Wu et al., 2025). Preparedness also aims to renew the resources needed to respond to disaster events so that they can be used effectively during a disaster and know how to use them (Hermon et al., 2023; Indika et al., 2023; Sari et al., 2023).

Disaster risk reduction preparedness is very important to face disasters because school age children are very at risk if a disaster occurs, because school age children are still looking for information through the knowledge they have gained. School age groups who are not equipped with knowledge will be a problem and cannot be ignored (Ernawati, 2024; Faizah et al., 2016)

Floods are one of the natural disasters that often occur in Indonesia, including in Riau Province. Kampar Regency, especially the Perhentian Raja area, is one of the areas prone to flood disasters. Floods that often occur in Kampar Regency are natural disasters caused by the morphological and physical conditions of the area which is dominated by lowlands around the Kampar and Siak rivers as well as other rivers in Kampar Regency, due to the inability of the river channels to accommodate, store and channel water, causing the water to overflow out of the channels through embankments and inundate the surrounding area (Hermon et al., 2024). SMA Negeri 1 Perhentian Raja School, as an educational institution in the area, has an important role in preparing its students to face potential flood disasters. The level of students' preparedness in facing flood disasters is an important indicator to assess the extent to which they are able to respond and act when a disaster occurs. This school is often hit by flooding during heavy rain and high tide, because the school is not far from the river, so when the water rises, the school will be submerged, as will the houses of the residents who are in the school. Disaster preparedness is crucial in facing and reducing the negative impacts of disasters. Especially in the school context, student preparedness can minimize the risk of injury, material loss and disruption to the teaching and learning process.

Based on the background that has been described, this research aims to determine the impact of flood disasters in schools, the level of students' preparedness for facing flood disasters, and formulate strategies for developing student preparedness at SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province.

Method

This research uses a mixed approach (mix-method). According to Sugiyono (2016) mix method combining two research methods, namely quantitative and qualitative, into a research activity, so that the data obtained will be more comprehensive, valid, reliable and objective. This research was conducted by SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province. With astronomical lines 01°00'40" north latitude to 00°27'00" south latitude and 100°28'30" – 101°14'30" east longitude. It can be seen in figure 1.

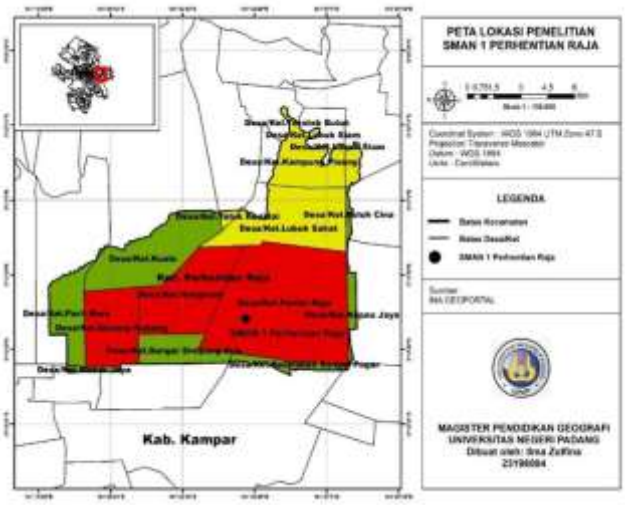

Figure 1. Map of SMAN 1 Perhentian Raja

The sampling technique used in this research is purposive sampling. purposive sampling is a sampling

technique with certain considerations (Sugiyono, 2015). To determine the impact of the flood disaster, samples were taken of teachers and students, to determine the level of student preparedness. The population was all class X students totaling 180 people. Based on the Slovin formula, the sample obtained for research was 65 students, and to formulate the development of student preparedness there were 7 experts using the AHP method (Analytical Hierarchy Process) namely (BPBD (regional disaster management agency), DISLUP (environmental service), traditional stakeholders, NGOs (non-governmental organizations, universities, teachers and students.

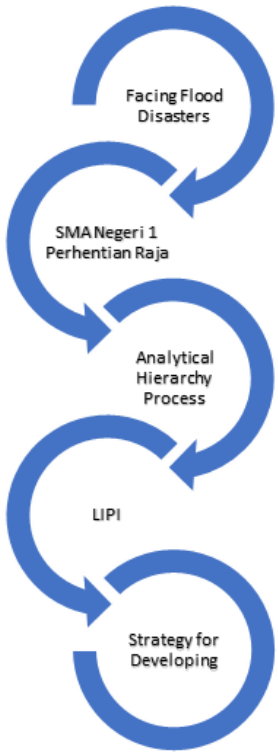

Figure 2. Research flowchart using AHP

In conducting an analysis of the impact of flood disasters in schools, researchers used the Miles and Humberman data analysis model which suggests that activities in qualitative data analysis are carried out interactively and continue continuously until the end.

Preparedness analysis is used to achieve research objectives regarding the level of student preparedness in facing flood disasters. Obtained from the results of research questionnaire data which refers to 5 preparedness parameters. These parameters consist of knowledge and attitude parameters, emergency response plans, early warning systems and resource mobilization. These categories have index values in table 1.

Table 1. Student Preparedness Index Value According to LIPI (LIPI UNESCO, 2006)

Index Value	Parameter Category
80-100	Very Ready
65-79	Ready
55-64	Almost Ready
40-54	Not Ready
Less than 40 (0-39)	Not ready

Determining the index value for each variable is calculated based on the formula:

$$Indeks = \frac{\text{Skor Rill Prameter Score}}{\text{Maximum Parameter} \times 100} \quad (1)$$

Information:
Parameter real score: The total value (score) obtained by the respondent.
Maximum score parameter: The maximum number of values (scores) or ideal scores that should be obtained from respondents.

In the analysis of strategies for developing student preparedness for flood disasters, researchers used the method Analytical Hierarchy Proces (AHP). Method AHP is a weighting of criteria by combining two criteria through a comparison matrix so that the value obtained from each criterion can be determined. There is a 1 - 9 standard scale in this method that can be used to score the weighting itself (Saaty, 1990). Table 2 shows the values and definitions of expert opinions in this scale.

Table 2. Evaluation Criteria in AHP

Mark	Information
1	A is as important as B
3	A is slightly more important than B
5	A is clearly more important than B
7	A is clearly more important than B
9	A is absolutely more important than B
2, 4, 6, 8	When in doubt between two adjacent values

Result and Discussion

The Impact of the Flood Disaster at SMA Negeri 1 Perhentian Raja

Floods are river water discharge that is relatively greater than normal due to rain that falls continuously upstream or in a certain place, so that it cannot be accommodated by the existing river channel, so the water overflows and inundates the surrounding area (Kalita et al., 2025; Ningrum & Ginting, 2020).

Floods are one of the natural disasters that often occur in Indonesia, including in Kampar Regency, Riau Province. One of the schools affected by the flood was SMA Negeri 1 Perhentian Raja. This flood caused

various negative impacts on schools, both in physical and non-physical (environmental) aspects.

Based on the results of interviews in the field, SMA Negeri 1 Perhentian Raja is one of the locations that was affected by flooding. The most severe flooding occurred between 2014 and 2018. From 2018 to 2024, this is still one of the locations affected by flooding, but not as badly as in previous years. The most recent flood occurred in March 2024. The cause of flooding at the school usually occurs due to long periods of high intensity rain, resulting in the ditch behind the school overflowing due to the flow of water from a large river, as well as the drainage which may not be able to accommodate rainwater discharge.

The duration of the flood usually lasts between one and seven days, with water levels of around 50 cm or sometimes only ankle high. The following is the condition of the ditch behind the SMA Negeri 1 Perhentian Raja school which can be seen in Figure 3.

Figure 3. Flood vulnerability map of Kampar Regency

Some of the impacts of the flood that occurred at SMA Negeri 1 Selamat Raja include physical and environmental impacts, including:

Physical Impact of Flooding at SMAN 1 Perhentian Raja School.

Floods can have a significant impact both in terms of infrastructure, equipment and teaching and learning processes. The following are some of the physical impacts that occurred due to flooding at SMAN 1 Perhentian Raja, namely:

(a) (b)

Figure 4. (a) The land is sinking, (b) Peeling wall paint

Based on Figure 4 (a) shows the impact of significant damage. It is clear that the building floors are badly damaged, cracked and even partially collapsed, this condition is very dangerous. Apart from damage to the floor, you can also see cracks in the walls of the building and moss growing at the bottom of the walls. Figure 4 (b) above shows the condition of the building behind the school at SMA Negeri 1 Terbaru Raja which was damaged due to the flood disaster. We can clearly see that the lower walls of the building have quite extensive water spots.

(a) (b)

Figure 5. (a) Windows that can't be closed, (b) The classroom floor is sloping

Based on figure 5 (a), it can be seen that The windows looked rusty and the paint was peeling. Some windows may be difficult to open or close properly due to damage caused by flooding and continuous rain. Figure 5 (b), this shows the condition of classrooms that were damaged due to the flood disaster. One of the obvious damages is the slope on the classroom floor.

Figure 6. The classroom wall is cracked

Based figure 6 shows cracks in the walls and floor. The flood also damaged school facilities and infrastructure at SMA Negeri 1 Perhentian Raja, such as sports fields, school gardens and playground equipment. This damage can disrupt the teaching and learning process and endanger student safety. Apart from that, flooding can cause loss of school items, such as textbooks, stationery and important documents. This can cause financial losses for schools and students.

Environmental Impact of Flooding at SMAN 1 Perhentian Raja School

Flooding at SMAN 1 Perhentian Raja also caused various environmental impacts, including: Water pollution, Ecosystem damage, and Garbage buildup.

Level of Student Preparedness for Flood Disasters at SMA Negeri 1 Perhentian Raja

Student preparedness data was obtained through the sum of knowledge questionnaires, attitude questionnaires, emergency response plan questionnaires, early warning system questionnaires, and resource mobilization questionnaires. From the questionnaire, students were categorized into five preparedness criteria, namely very ready, ready, almost ready, less ready and not ready, which were distributed to 65 respondents. The tabulation results of preparedness levels can be seen in the attachment. The following are the results of the questionnaire calculation of students' level of preparedness for flood disasters, namely.

Table 3. Index of Student Preparedness Parameters

Parameter	Number of Respondents	Index	category
Knowledge	65	86.5	Very Ready
Attitude	65	87.3	Very Ready
Emergency Response Plan	65	89.1	Very Ready
Disaster warning system	65	86.1	Very Ready
Resource mobilization	65	85.2	Very Ready
Preparedness Index		86.4	Very Ready

Source: Results of 2024 research questionnaire data analysis

Based on table 3 the result of the calculation of the level of preparedness of students facing flood disasters at SMA Negeri 1 Perhentian Raja is categorized as very ready with an index value of 86.4%.

Strategy for Developing Student Preparedness in Facing Flood Disasters

In this research, researchers used the method Analytical Hierarchy Process (AHP), which is a multi-criteria based decision making method. The hierarchical structure consists of three main levels, namely goals, criteria and alternatives. The alternative policy criteria which cover these three aspects are carried out in pairwise comparison analysis for each alternative criterion. The assessment was carried out after discussion with several respondents related to the research. The weighting is based on the AHP assessment criteria formulated by Saaty 1988 (Aksa & Afrian, 2022; Garschagen et al., 2021).

The results of the consistency ratio (CR) value after ranking the criteria in expert choice obtained a Consistency Ratio (CR) value = 0.01 and the results of the input data above obtained the criteria and their weight values, which can be seen in Figure 7.

Based on the results of the data analysis above, the criteria for student preparedness to face flood disasters at SMA Negeri 1 Perhentian Raja, the main criteria obtained are Student Preparedness Development Strategy (0.521), Student Preparedness Level (0.366) and Flood Disaster Impact at (0.113).

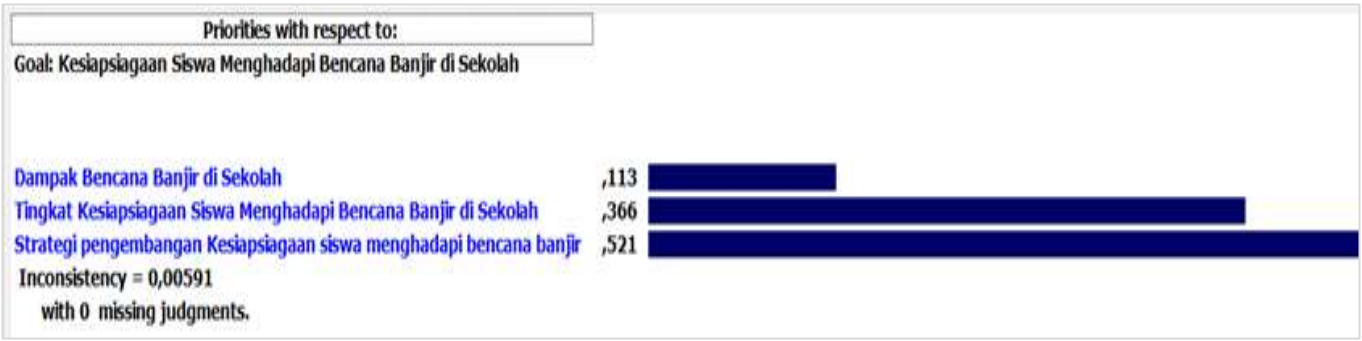

Figure 7. Criteria priority and weighting

After the priority criteria have been successfully determined, the next step is to calculate alternative priorities based on the weight values that correspond to each criterion. The weight value of each alternative is then calculated and adjusted according to its level of importance for each previously determined criterion. The final result of this process is a priority ranking of alternatives, which describes the best solution or most appropriate action based on all existing criteria which can be seen in Figure 7.

Supported by several studies, the development of a strategy for preparing students to deal with floods can be done through various effective approaches. Haque et al. (2024) emphasizes the importance of disaster education in schools as a way to prepare students with the knowledge and skills needed to act before, during, and after a disaster. Other studies have also shown that environmental education can increase students' awareness of the risk of flooding by providing a better understanding of its causes and impacts (Garschagen et

al., 2021; Haque et al., 2024; Pawlik et al., 2025). Furthermore, several studies show that technology, such as mobile applications and computer simulations, can be used to train students to deal with floods interactively, providing useful practical experience (Di Noia et al., 2025; Kays et al., 2025).

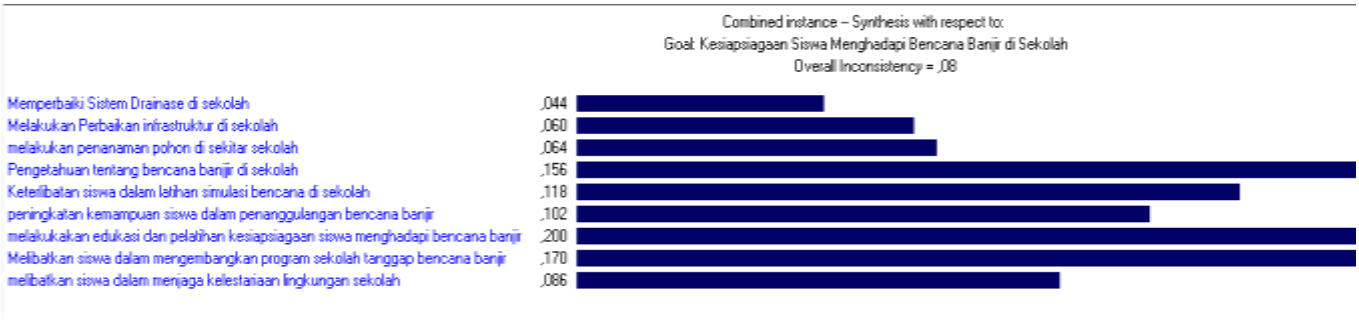

Figure 8. Existing criteria

The results of an analysis using the method Analytic Hierarchy Process (AHP) using Expert Choice calculations. Results of comparison of alternative strategies in increasing students' preparedness in facing flood disasters against all criteria for obtaining grades Consistency Ratio (CR) of 0.08. Based on the matrix and criteria above, 9 alternatives and their weight values are obtained: Improving drainage systems in schools (0.044). Planting trees around the school (0.060). Infrastructure Improvement in Schools (0.064). Knowledge about Flood Disasters (0.156). Student involvement in disaster simulation at school (0.118). Increasing Student Ability in Flood Management (0.102). Carrying out education and training on student preparedness in facing disasters (0.200). Involving students in developing disaster response schools (0.170). Involving students in preserving the school environment (0.086).

Conclusion

The impact of the flood disaster at SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province. It can be concluded that SMA Negeri 1 Perhentian Raja in Kampar Regency, Riau Province, related to flooding, showed a mild impact on the physical and environmental aspects of the school. Floods caused by high rainfall and less than optimal drainage systems have damaged school infrastructure, including buildings, facilities, equipment and facilities that support teaching and learning activities. In addition, the environment around the school is also affected, with water pollution and ecosystem damage endangering the health of school residents. The level of student preparedness in facing flood disasters at SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province, was measured using 5 parameters, namely knowledge of 86.5%, attitude of 87.3%, emergency response plan of 89.1%, disaster warning system of 86.1%, and resource mobilization of 85.2%, based on 5 parameters it was found that the overall level of student preparedness was classified as "Very Ready" with the average index was 86.4%. Strategy for developing students' preparedness for flood disasters at SMA Negeri 1 Perhentian Raja, Kampar Regency, Riau Province. The preparedness development strategy uses method analysis Analytical Hierarchy Process (AHP) with application calculations Expert choice Obtaining alternative priorities provides an overview of the most effective steps in increasing student preparedness. There are 9 alternatives for formulating strategies for developing preparedness, including improving drainage systems in schools, planting trees around schools, improving infrastructure in schools, knowledge about flood disasters, involving students in disaster simulations at schools, increasing students' abilities in flood management, conducting education. and training on student preparedness for disasters, involving students in developing disaster response schools, and involving students in preserving the school environment. This alternative can reduce the risk of flood disasters at SMA Negeri 1 Perhentian Raja School.

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Author Contributions

Ilma Zulfina contributed to the conceptualization of the study, data collection, and analysis, and was responsible for writing the initial draft of the manuscript. Dedi Hermon assisted in the study design, provided expertise in data interpretation, and critically reviewed the manuscript for intellectual content. Both authors approved the final manuscript for submission and agreed on the overall content and direction of the research.

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Conflicts of Interest
The authors declare no conflict of interest.

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