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Decision Support System for Flood Disaster Assistance Recipients Using the Analytical Hierarchy Process Method

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Abstract*—Natural disasters are things that cannot be avoided by human hands. Disasters like this can happen to all kinds of social groups. This research hopes to help flood victims by creating a computer-based decision support system to determine how much to give to victims based on the burden they bear. Based on places that are frequently affected by natural disasters, the sources of information in this study were taken from trusted journals and information from several victims who had been affected by this natural disaster. Selection of information from victims is determined purposively, taking into account that they are included in the people who know or experience the disaster. Analysis is useful for determining how much assistance is needed based on the impact of damage, flood height, number of family members, fatalities, and sick family members using the Analytical Hierarchy Process (AHP). The results of the research are expected to be effective in helping victims of natural disasters based on the burden they bear*.

***Keywords*—** *Flood victims, decision support systems, Analytical Hierarchy Process (AHP).*

I. INTRODUCTION

Indonesia is a country prone to natural disasters such as floods, landslides, volcanoes, earthquakes (with potential for tidal waves or not). This is because Indonesia is a tropical country, since mid-2021 disasters have continued to occur in Indonesia, the National Disaster Mitigation Agency recorded 1,045 disaster in 2021. The potential for disaster events in Indonesia has resulted in misfortune as far as material and non-material encounters are experienced by victims of disaster events, for example losing their homes to losing relatives. This brings the movement of finances to a standstill, which makes disaster victims that much more of a hassle.

Floods are influenced by high rainfall factors, the land surface is lower than sea level. Under these conditions, the accessibility and distribution of social assistance for disaster survivors is quite large, which is done so that friendly assistance reaches its destination, on time, and according to the needs needed by disaster victims. In the event that the distribution of social assistance that is most commonly carried out is not as expected, then problems will arise caused by the provision of imperfect assistance. One of the current strategies for distributing natural disaster assistance only looks at the level of losses experienced by victims, this technique for distributing natural disaster assistance is considered unjustifiable [2].

Analytical Hierarchy Processing (AHP) is a strategy for solving what is happening into several parts or parts at various levels of the plan, by giving emotional qualities to each variable relatively and finding out which variables are most needed or make sense, to influence the results in certain situations [3]. In previous exams that applied the AHP strategy, the results of this study have options to provide elective problems that are being faced and have options to carry out stages. Therefore, this study uses the AHP strategy to determine beneficiaries of natural disaster assistance.

II. LITERATURE REVIEW

A. Definition of Decision Support System

Decision Support System is a computer-based system that can support semi-structured decision making, by utilizing data and then processing it into information in the form of suggestions that can assist in making final decisions [4]. SPK consists of four stages of the process [6], namely:

1) *Intelligence*, is a process that identifies problems that require a decision to later be processed into relevant information to make a final decision.
2) *Design*, create, develop and perform analysis for each alternative that will be used according to the problem to be analyzed.
3) *Choice*, choose the best alternative that has been evaluated and obtained based on the highest value of each alternative tested.
4) *Implementation*, implementation of the options that have been selected, if the implementation fails it will return to the modeling process.

B. Analytical Hierarchy Process

The Analytical Hierarchy Process is a strategy for selecting elective options and choosing the best measure. AHP cultivates a score that positions each elective choice, given the extent to which each elective meets the criterion size [4]. In this review, the hypothesis enjoys several benefits such as determination and convenience for quantitative and subjective properties, and considering legitimacy, to the furthest range of rules and options that this review can choose.

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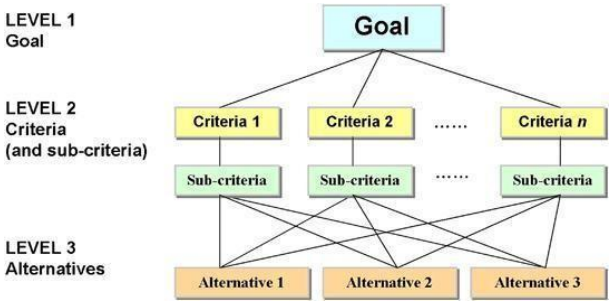

Figure 1 AHP Criteria

Weighting on AHP is used to determine weight criteria and sub-criteria according to decision makers [7]. The AHP approach is used to break down complex and unstructured situations into components, placing variables in hierarchical order [3]. The AHP process measures the consistency of judgment with a consistency ratio. To produce a good decision, good consistency is needed, and the consistent value must be 0.1 otherwise it must be recalculated [8]. The stages in using the AHP Method are as follows:

1. Develop a hierarchy of problems being undertaken.

At the highest level, setting takes the form of goal setting. The level consists of the criteria used to evaluate potential alternatives and consider them. The value of each intensity is a sub-criteria for each criterion.

2. Make pairwise comparisons.

Make comparisons between criteria with other criteria through a matrix, which describes the level of importance between the criteria being compared.

3. Synthetic.

Consideration for correlation should be included to obtain general requirements. By plugging in the quality of each share, separating the value of each segment by the associated share to get a standardized network, then adding the quality of each frame and partitioning by the number of components to get the load, then, at that point, estimating the consistency of a rule's check grid. The specified lattice can be predicted with the assumption that the value of CR ← 0.1. When the method has been completed, pairwise testing is performed between the options for each model to produce a weighted value. Then the binding system is completed to know the last value of every other option.

III. RESEARCH METHODOLOGY

1.1. Method of collecting data

According to Wiratna Sujarweni, the data collection method is a method that researchers use to reveal or collect data from respondents or informants according to the data selected for research. There are several research data collection techniques that are commonly used such as tests, interviews, observations, questionnaires or questionnaires, surveys, and document analysis. However, researchers used data collection techniques as follows:

1. Observations

Observation is a formal observation and recording of symptoms that appear on the research object. Observations are considered important by researchers, so researchers can test the quality of the truth of a problem being tested.

2. Interviews

Interview is one of the methods used to retrieve results orally. This is done in order to obtain detailed information according to the object being studied.

3. documentation

Documents are information about past situations. Documents can also be in the form of writing, drawings or monumental works. If accompanied by related documents, the analysis and interview findings will be more reliable (Sujarweni, 2019). Documentation is a method of collecting data as a support for the problem being studied.

IV. RESULTS AND DISCUSSION

There are 5 criteria that are calculated in this system, including:

- Damage category.
- Flood high category.
- Number of family members.
- Fatalities
- Sick family member

TABLE 1. Comparison of Criteria

Criteria	Damage category	Category tall	Number of Family Members	Victimsoul	Sick family member
Damage category	1	3	3	0.2	0.33
High category	0.33	1	3	0.14	0.5
Number of Family Members	0.33	0.33	1	0.11	0.2
Fatalities	5	7	9	1	5
Sick family member	3	2	5	0.2	1
Total	9,66	13,33	21	1.65	7.03

Information:

- The damage category has an importance level of 3 times compared to the high category, while the high category has an importance level of 0.33 compared to the damage category.
- The category of damage has an importance level of 3 times compared to the category of Number of Family Members, while the category of Number of Family Members has an importance level of 0.33 compared to the category of damage.
- The damage category has an importance level of 0.2 times compared to casualties, while fatalities have an importance level of 5 compared to the damage category.
- The damage category has an importance level of 0.33 times compared to sick family members, while sick family members have an importance level of 3 times compared to the damage category.
- The high category has an interest level of 3 times compared to the number of family members, while the number of family members has an importance level of 0.33 times compared to the high category.

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- The high category has an importance level of 0.14 times compared to fatalities,While fatalities have an importance level of 7 times compared to the high category.
- The high category has an importance level of 0.5 times compared to sick family members, while sick family members have an importance level of 2 times compared to the high category.
- The number of family members has an importance level of 0.11 times compared to the number of victims, while the number of victims has an importance level of 9 times compared to the number of family members.
- The number of family members has an importance level of 0.2 times compared to sick family members, while sick family members have an importance level of 5 times compared to the number of family members.
- Casualties have an importance level of 5 times compared to sick family members, while sick family members have an importance level of 0.2 times compared to fatalities.

TABLE 2. Calculation of Criteria

	Damage category	Category tall	Number of Family Members	Victim soul	Sick family member
Damage category	0.1035	0.2250	0.1428	0.1212	0.046
High category	0.0341	0.0750	0.1428	0.0848	0.071
Number of Family Members	0.0341	0.0247	0.0476	0.0666	0.028
Fatalities	0.5175	0.5251	0.4285	0.6060	0.711
Member sick family	0.3105	0.1500	0.2380	0.1212	0.142
Total	1	1	1	1	1

Vector priority	Weight	EigenValue
0.639586875	0.127917375	1.235681843
0.408009628	0.081601926	1.087753669
0.201652896	0.040330579	0.846942164
2.788599214	0.557719843	0.920237741
0.962151386	0.192430277	1.352784848
5	1	5.443400265

TABLE 3. Criteria Value

No	Criteria	Weight
1	Damage category	0.127917375
2	High category	0.081601926
3	Number of Family Members	0.040330579
4	Fatalities	0.557719843
5	Sick family member	0.192430277

TABLE 4. Criteria Value for Damage Category

No	Damage	Weight
1	Light (front page)	0.106014179
2	Moderate (enters the house)	0.25998883
3	Height (house sink)	0.633996991

TABLE 5. High Category Criteria Value

No	Tall	Weight
1	Lightweight (<60cm)	0.122276688
2	Medium (60-150cm)	0.229302832
3	Height (>150cm)	0.648420479

TABLE 6. Criteria Value for the category of fatalities

No	Fatalities	Weight
1	No victims	0.109285756
2	1 victim	0.309250427
3	More than 1 victim	0.581463817

TABLE 7. Criteria Value Category Number of Family Members

No	Number of Family Members	Weight
1	(2-3 people)	0.128501401
2	(3-5 people)	0.276610644
3	(> 5 people)	0.594887955

TABLE 8. Criteria for the Category of Sick Family Members

No	Sick Family Members	Weight
1	There isn't any	0.11492674
2	1 member	0.182234432
3	More than 1 member	0.702838828

V. CONCLUSIONS

A. Conclusion

After conducting research and identifying the problem, there is a major problem in the distribution of flood assistance by the kelurahan to local residents at this time, namely, the distribution of the distributed aid is sometimes uneven, this is because the calculation and distribution of aid funds is still done manually by the kelurahan.

This problem can be overcome by a system that has been created using the Analytical Hierarchy Process method. The distribution of financial assistance can make it easier for the village administration to distribute it evenly to residents affected by the flood disaster.

B. Suggestions

The advice that can be given in this research is that the system created must be further developed, not just focusing on the problem of flood disasters, because many natural disasters have occurred in Indonesia. As well as further research can increase the efficiency of the system that has been made.

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