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Implementation Of Analytical Hierarchy Process (AHP) In Determining Criteria For New Housing Development And Best Locations In Tasikmalaya City

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Abstract
The growth in the number of households with access to decent and affordable housing in Tasikmalaya City continues to increase. This indicates that housing development in Tasikmalaya City is undergoing significant progress. The criteria for selecting housing vary widely, depending on the priorities of each individual, in line with their expectations for the housing they will live in. These varied choices present challenges for both housing developers and the public in determining the criteria and location of housing. This study aims to develop an information system that can support housing development in new housing projects in Tasikmalaya City. This goal is achieved by creating a Decision Support System (DSS) that considers all housing selection criteria to accelerate and simplify the decision-making process, using the Analytical Hierarchy Process (AHP) method. The research findings indicate that the risk criterion is the highest priority according to the views of stakeholders and the general public, while the design criterion is given the least priority. Information based on selected criteria can be accessed through the "Sistem Masa Depan" (SIMADEP) application, which assists users in making informed decisions.
Keywords: Analytical Hierarchy Process (AHP), Decision Support System (DSS), Housing

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I. INTRODUCTION

The growth in population increases the demand for basic needs, such as housing. Owning a home is a dream for everyone, as a house is one of the basic human needs, essential for shelter and the continuation of family activities [1]. This has also led to a surge in the development of new land for housing projects, both in urban and rural areas [2].

Based on UU RI Nomor 4 tahun 1992 about "perumahan dan permukiman" Since a house is a basic human need, housing is a necessity that must be fulfilled. Therefore, it is important to create conditions that encourage the development of housing while ensuring the continued availability of housing for all segments of society, so that everyone can have a good, healthy, safe, harmonious, and livable home [3].

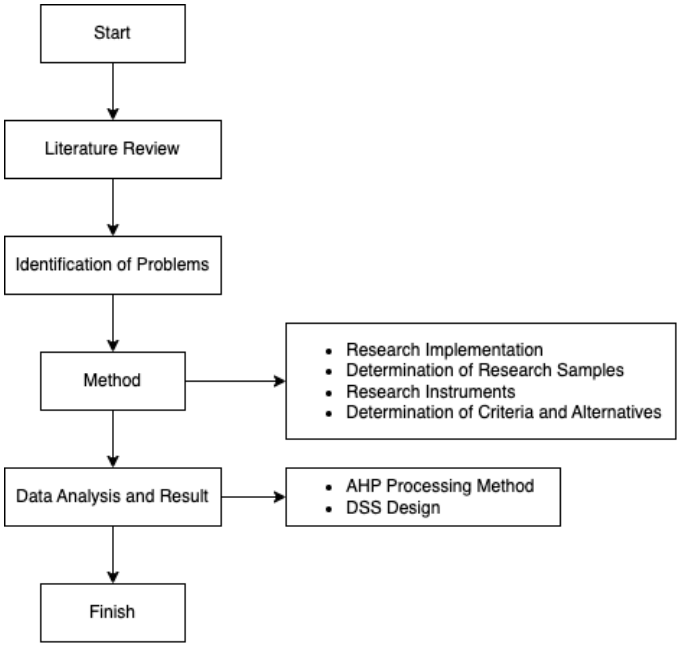
According to data published by the Badan Pusat Statistik of Tasikmalaya City, in 2024, only 48.82% of households have access to decent and affordable housing [4]. Based on UU RI Nomor 1 pasal 1 tahun 2011Housing is a collection of houses that are part of a settlement, whether in urban or rural areas, equipped with infrastructure and public utilities as a result of efforts to provide decent and livable homes [5]. The selection of housing requires several considerations, such as public facilities, security, price, and the width of the roads in the housing area [6]. Accuracy in choosing the location is an important factor in the development of strategically located housing [7]. The criteria for selecting housing vary widely, depending on the priorities chosen based on individual expectations for the housing that will serve as their residence. The variety of choices regarding housing criteria becomes a challenge for both housing developers and the public, as people may struggle to prioritize the right criteria, making it necessary to consult experts' opinions [8].

The development of information technology today has a strong impact on nearly all aspects of life [9]. Therefore, a Decision Support System (DSS) is needed, which must consider all the standards that support decision-making in order to assist, accelerate, and simplify the decision-making process. The use of a Decision Support System can reduce the risk of errors in decision-making, particularly when determining the criteria for selecting the location of new housing developments. The Analytical Hierarchy Process (AHP) method is used to obtain objective and accurate results according to consumer needs. The use of the AHP method aims to help address the complexity of decision-making when determining the criteria for the best location for housing

development [10]. Although the percentage of households with access to decent and affordable housing in Tasikmalaya City is below 50%, there was an increase of 3.40% in 2023 compared to the previous year. This indicates that housing development in Tasikmalaya City is not stagnating [4].

Based on the explanation above, there is a need for a system to assist in making decisions regarding the prioritization of criteria and the selection of the best location for new housing developments, in order to meet the housing needs of both the community and developers in Tasikmalaya City.

II. MATERIALS AND METHOD



Picture 1. Research Stages.

This study focuses on the implementation of AHP in a Decision Support System (DSS) to provide the information needed by both the community and developers. Previous research has indicated that the use of an AHP-based decision support system reduces the risk of errors in decision-making [11]. AHP has the advantage of facilitating decision-making by performing pairwise comparisons of each criterion related to a particular issue, thus deriving weight values for the importance of each criterion [12].

A. Determination of the Research Sample

This study uses two sampling techniques: random sampling and purposive sampling. The sample for this study consists of twelve respondents, with ten respondents from the general public and two additional respondents who are stakeholders or key persons related to development in Tasikmalaya City. The ten respondents consist of one individual randomly selected from each subdistrict in Tasikmalaya City. The ten respondents consist of one individual randomly selected from each subdistrict in Tasikmalaya City, who are of productive age and have plans to own a home in Tasikmalaya City. The other two respondents are representatives from the Transportation Department and the Building and Housing Supervisory Department of Tasikmalaya City.*Pengumpulan Data*

The data collection instrument used in this study is a questionnaire. A questionnaire is a data collection technique where several statements or written questions are provided to respondents to be answered. In this study, the questionnaire was distributed to respondents with the questionnaire format shown.

No	Criteria	Scale Value																	Criteria
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
1	House Design																		House Price
2	House Design																		Location Distance
3	House Design																		Land Condition
4	House Design																		Infrastructure
5	House Design																		Risk
6	House Price																		Location Distance
7	House Price																		Land Condition
8	House Price																		Infrastructure
9	House Price																		Risk
10	Location Distance																		Land Condition
11	Location Distance																		Infrastructure
12	Location Distance																		Risk
13	Land Condition																		Infrastructure
14	Land Condition																		Risk
15	Infrastructure																		Risk

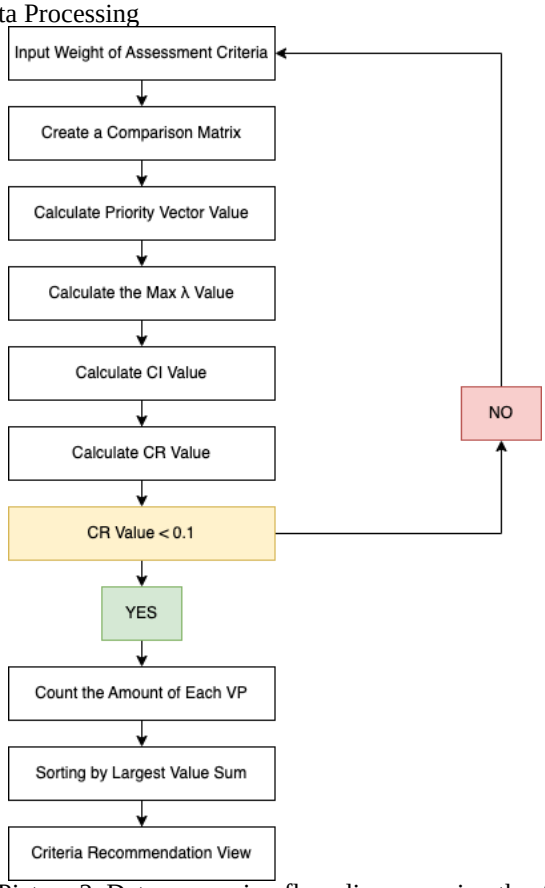
Table 1. Questionnaire filling format.

The criteria selected are further explained in Table 2.

Type	Code	Detail
House Design	K1	Home design is more important because when the home design is in accordance with your wishes, it will make the home more comfortable.
House Price	K2	The price of the house is more important because the price of the house offered must be in accordance with the infrastructure, land conditions and possible risks. The price of the house is according to the standards and capabilities of the consumer.
Location Distance	K3	The distance of the location is more important because the distance of housing to the city center such as: malls, sacred houses, educational facilities, entertainment venues, and access to other community services must be easy and close.
Land Condition	K4	The condition of the land is more important because the slope of the land, land network, water network, soil structure, and environmental conditions greatly determine the quality of housing in the long term.
Infrastructure	K5	Infrastructure is more important because facilities in housing must be available such as: 24-hour security guards, playgrounds, mosques, CCTV, sports facilities, garbage disposal, etc.
Risk	K6	Risk is more important because a place to live with minimal risk such as: disaster prone, free from flooding, landslides, and drought, it will make a place to live a safe home.

Table 2. Explanation of selection criteria.

Data Processing



Picture 2. Data processing flow diagram using the AHP method.

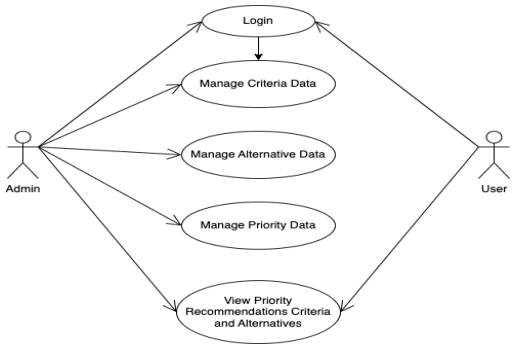
Data processing is carried out using the AHP method. The AHP method is an approach that can be used as a decision-making tool with hierarchical criteria. In this case, it can be implemented in the context of recommending criteria for selecting new housing in Tasikmalaya City, as a process for determining the weight of each criterion. The steps of the AHP method that will be applied to determine the priority of housing selection criteria are illustrated in Figure 2..

The data processing conducted in this study refers to previous research with the following formula :

1. Vektor Prioritas (VP) Obtained from the summation of the normalized criterion matrix, which is then divided by the total number of criterion elements.
2. Nilai *Consistency Index* (CI)
   Nilai CI Resulting from:
   CI = (λ maks-n) / (n-1)
   where:
   n = the number of criterion elements
3. Nilai *Consistency Ratio* (CR)
   Nilai CR Resulting from:
   $$CR = \frac{CI}{CR}$$
   CR = *Consistency Ratio*
   CI = *Consistency Index*
   RI = *Random Consistency Index*
   In the AHP model, the principle of transitivity or 100% consistency is not a requirement. For the AHP method, the comparison matrix is acceptable if CR ≤ 0.1

A. DSS Design

In this study, the decision support system that is developed is a decision support system In this study, the decision support system that is developed is a decision support system for recommending priority criteria and locations for new housing in Tasikmalaya City. The system that will be developed will later be applied to provide recommendations to the public or developers who need data regarding the priority criteria for housing, which have been calculated using the AHP method, and alternative locations based on respondents' perceptions.



Picture 3. DSS Design.

III. RESULT AND DISCUSSION

Results of data processing from respondents

Based on the perceptions of 10 respondents from the community, as shown in the table above, the criterion K6, or risk, is the highest-priority criterion as it has the highest total VP value of 2.198. On the other hand, criterion K1, or house design, is the lowest-priority criterion, as it has the lowest total VP value of 1.030.

Kriteria	Responden										Total VP	RANK
	1	2	3	4	5	6	7	8	9	10		
K1	0.074	0.085	0.270	0.096	0.108	0.093	0.086	0.070	0.076	0.071	**1.030**	6
K2	0.122	0.192	0.125	0.115	0.118	0.110	0.110	0.126	0.218	0.140	**1.375**	5
K3	0.294	0.169	0.158	0.167	0.213	0.163	0.144	0.126	0.155	0.222	**1.811**	3
K4	0.175	0.204	0.111	0.279	0.161	0.194	0.294	0.214	0.148	0.159	**1.940**	2
K5	0.153	0.161	0.156	0.141	0.169	0.159	0.223	0.234	0.132	0.119	**1.647**	4
K6	0.182	0.188	0.180	0.202	0.232	0.281	0.144	0.230	0.271	0.288	**2.198**	1

	Responden		Total	RANK
	1	2		
K1	0.076	0.078	0.153	6
K2	0.107	0.090	0.197	5
K3	0.192	0.111	0.303	3
K4	0.196	0.305	0.500	2
K5	0.086	0.155	0.241	4
K6	0.344	0.261	0.606	1

Table 4. Results of data processing from stakeholder respondents.

Based on the perceptions of two stakeholder respondents, as shown in the table above, criterion K6, or risk, is the highest-priority criterion as it has the highest total VP value of 0.606. On the other hand, criterion K1, or house design, is the lowest-priority criterion as it has the total VP value of 1.153.

Implementation of AHP as DSS

The system implementation is a stage aimed at applying the system according to the design to solve the problems identified in the study. The steps in this system

implementation include the process of displaying the ranking of recommended criteria values and alternative locations for new housing in Tasikmalaya City, which have been previously calculated using the AHP method. The implementation is carried out through the development of the Future System application (SIMADEP).

On the initial page, there is a login page that functions to request access for both user and admin data. The user and admin data obtained will be validated first, as the system being developed is a closed system. Users and admins can access the system if the submitted data is valid. The appearance of the login page is shown in Figure 4

Picture 4. Login View.

On this page, both users and admins will log in using different access codes. Below are some of the differences between the user and admin:

a. **User** is an application user who can only view the recommendations from the AHP ranking that has been generated.

b. **Admin** is the person who manages the application system, from inputting data values to generating the ranking values.

Below is the appearance of the user and admin pages of the SIMADEP application:

1. User Application View

a. The user home page is used to view the recommendation results. On this page, the user is required to choose between one of the two options: alternative or criterion.

Picture 5. User homepage.

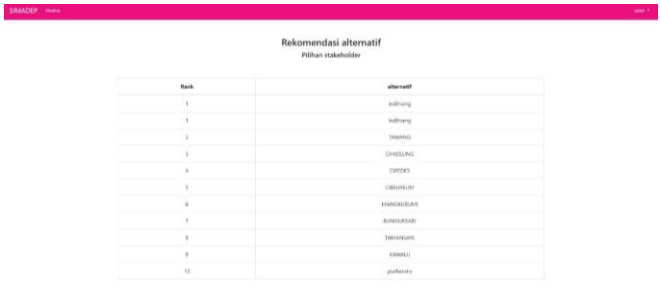
b. After one of the options is clicked, the user must then select the recommendation results from either stakeholders or thecommunity.

Picture 6. Respondent's choice recommendation page.

c. Next, when the user selects the 'alternatives' page and 'community,' they will be directed to the community's alternative recommendations page

Picture 7. Alternative ranking page chosen by the public.

d. When the user selects the 'alternatives' page and 'stakeholders,' they will be directed to the stakeholders' alternative recommendations page



Picture 8. Alternative ranking pages chosen by stakeholders.

e. When the user selects the 'criteria' page and 'community,' they will be directed to the community's criteria recommendationspage.

Picture 9. Community choice criteria ranking page.

f. When the user selects the 'criteria' page and 'stakeholders,' they will be directed to the stakeholders' criteria recommendations page.

Picture 10. Stakeholders' choice criteria ranking page.

2. Admin application view

a. Admin home page

Picture 11. Admin homepage.

b. After clicking on 'input data,' there are two options that the admin can choose from: to input alternative data or to input criterion data.

Picture 12. Alternative value or criteria input selection page.

c. Once one of the options is selected, for example, if the admin chooses 'criteria,' the admin can then click on either 'community' or 'stakeholders,' depending on the data to be input.

Picture 13. Community or stakeholder value input selection page.

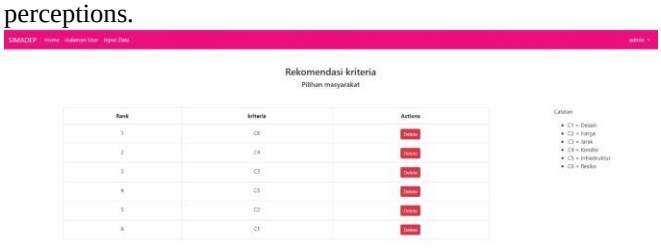
d. If 'community' is selected, the admin will input all the community's data based on the ranking of criteria or alternatives that have been obtained.

Picture 14. Respondent community criteria value input page.

Picture 15. Public respondent alternative value input page.

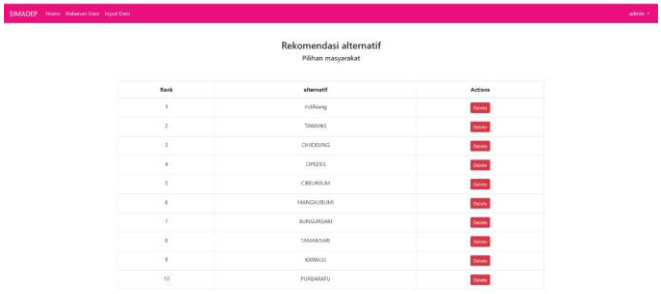
*If 'stakeholders' is selected, the admin will input all the stakeholders' data based on the ranking of criteria/alternatives that have been obtained.

e. Below is the appearance of the recommendation results for the ranking of criteria based on the community's perceptions.



Picture 16. Community criteria value ranking display page.

f. The appearance of the recommendation results for the ranking of alternatives based on the community's perceptions is as follows.



Picture 17. Alternative community value ranking display page.

IV. CONCLUTION

Based on the assessment conducted on the implementation of the Analytical Hierarchy Process (AHP) in determining the criteria for new housing development and the best location in Tasikmalaya City, the following conclusions can be drawn:

A decision support system for selecting housing location criteria has been developed using the Analytical Hierarchy Process (AHP) method with the aim of assisting developers and the people of Tasikmalaya City in making decisions about the selection of the best housing location criteria in the Tasikmalaya City area.

The implementation of the Analytical Hierarchy Process (AHP) method resulted in criterion K6, or risk, being the most prioritized criterion, as it has the highest total VP value of 0.606. Criterion K1, or house design, is the lowest priority, with the lowest total VP value of 1.153. The risk of disaster occurrence is an important factor to consider or prioritize when selecting housing, as even a well-designed house, if built in a high-risk disaster area, will not feel comfortable and safe as a place to gather and take shelter.

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