Determination System for House Improvement Recipients In Serdang Bedagai By Using Clustering K-Means Method And Višekriterijumsko Kompromisno Rangiranje (Vikor)

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Abstract. To improve the welfare of the community, the Government created a program called Bantuan Stimulan Perumahan Swadaya (BSPS) or better known as house improvement program. One of the implementations is in Kabupaten Serdang Bedagai. Therefore, we need a system capable of grouping the house situation of the poor then ranked to determine the priority in obtaining Program Bedah Rumah. For grouping were done using k-means clustering method consists of several criteria: welfare status, number of individuals in the family, type of floor, type of wall material, type of roof, use of toilet facility, type of toilet, and final disposal place. Then in ranking is used one of the multi-attribute decisions making method Višekriterijumsko Kompromisno Rangiranje (VIKOR). The criteria were used in ranking are the sources of drinking water, the primary lighting source and the cooking fuel. From the test results of 1,180 poor households (RTM) data produced 3 clusters of 538 RTM in cluster 1, then 593 RTM on cluster 2 and 49 RTM on cluster 3. The house improvement program assistance on the first year will be given to 185 RTM, then second year for 162 RTM, third year for 300 RTM, fourth year for 250 RTM, fifth year for 150 RTM and the last year for 133 RTM.

1. Introduction

Poverty is one of the social problems that exist in Indonesia. According to the Badan Pusat Statistik (BPS) in March 2016, the number of poor people in Indonesia reached 28.01 million people (10.86%), decreased by 0.50 million people compared to September 2015 condition of 28.51 million people (11, 13%).

According to BPS data, the population in Kabupaten Serdang Bedagai is 608,691 people, consisting of 305,513 male and 303,178 female lives in 243 villages. From 17 subdistricts in Serdang Bedagai, there are 151,892 poor people and 36,061 poor households (RTM). The poorest sub-district is Kecamatan Perbaungan 19,075 while Kecamatan Kotarih has the lowest poor population of 1,395.

The Government has made efforts to reduce the number of poor people through the provision of assistance such as National Health Insurance, Healthy Indonesia Card, Home Surgery Program and others. One of the poverty reduction programs that will be provided by the government of Serdang
Bedagai is House Improvement. In addition, there are 21% of the population in Serdang Bedagai who do not have proper sanitation.

For the procedure of conducting home surgery aid, the habitable home should have several criteria such as floor type, wall type, roof type, use of defecation facility, type of closet, final disposal place, the number of individuals in the family and their welfare status until decile to 4. Welfare status until the 4th decile is 40% of the poorest population. Decil 1 means 10% of the total poor population.

In the implementation of house improvement, faced with budget constraints determined by the government. Therefore, the community that can be proposed as beneficiaries is not proportional to the number of targeted communities that exist so that bias occurs in the submission of proposals and verification.

In this research, the authors intend to build a system capable of clustering the criteria of house improvement so as to obtain the feasibility level of a home, then done ranking to determine priority in obtaining house improvement. So that the distribution of house improvement is done well and right on target so as not to cause confusion so true to poor households in need.

2. Problem Identification
The problem faced is the selection of poor households still manually and takes a long time in determining the recipients of home surgical assistance conducted by the Badan Perencanaan Pembangunan Daerah (Bappeda) Serdang Bedagai so that needs to be developed a system that can help Bappeda to determine the recipients of house improvement.

3. Previous Research
Some research that has been done before, such as The research conducted by Sarjono Z. A. Z determines the priority group of recipients of home improvement using k-means clustering method. The research object used is the data of poor people in North Bahar Sub-district Jambi using 6 criteria namely welfare status, roof type, floor type, wall type, building control status and the number of individuals in the family. This study resulted in 3 clusters for population selection which became the top priority for obtaining house improvement[1].

The subsequent research was conducted by Dewi, N.P.S, which is analysis and design of the system of recipients of Bali Mandara's Home Improvement Recipients by Using Entropy and MADM TOPSIS. This study used 12 criteria to rank the applicant data for home surgical assistance. In this study found the name of the applicant for home surgery assistance is more in need based on period [2].

The research conducted by Lengkong, S. P., Permanasari, A. E., & Fauziati, S for scholarship selection using 4 criteria are achievement index, semester, electric power and total electricity bill to assist the selection process and determine the scholarship recipient. The results showed that the use of the MADM method that is VIKOR can help the selection process and determine the scholarship recipient [3].

Subsequent research was conducted by Imanuwelita, V., Putri, RRM, & Amalia, F determining the feasibility of franchise location using AHP and VIKOR method with 7 criteria that is the number of competitors, business place infrastructure, distance from the supplier, renting price, location and salary of employees. The result obtained is the eligibility status of each proposed business location [4].

Subsequent research was conducted by Fitrah, K namely decision support system with k-means clustering method and F-AHP in determining recipients of Raskin rice. In this system to use the income of the head of the family, the number of dependents of the head of the family, and the value of the family property as the criterion of grouping. As for the criteria of ranking is used 4 criteria that is the source of lighting, the work of the head of the family, the education of the head of the family and the commitment of the head of the family. The result of this research is the name of recipients of Raskin rice obtained from the most feasible clusters [5].

4. Methodology
The method proposed for determining the recipient of a house improvement consists of several stages. The stages are started from preprocessing data in the form of parsing and cleaning. The next stage of clustering, in this stage, begins by determining the number of clusters, determining the center point of the cluster (centroid), calculate the distance between data with the Euclidean distance equation, allocate
the data to the nearest cluster. The next stage is the decision making, where the data has been grouped will be ranked. Starting from making a normalized decision matrix based on the criteria and alternatives, determining the positive and negative ideal solutions, calculating the utility measures, calculating the VIKOR index, and performing the alternate ranking so that the results of the recommendations are eligible to receive home surgical assistance. The stages can be seen in the form of general architecture in Figure 1.

![General Architecture Diagram]

### Figure 1. General Architecture

#### 4.1. Data Used
The data used in this study comes from integrated data for the handling of the poor in Kabupaten Serdang Bedagai. From the integrated data is taken data of unsuitable housing with welfare status until the fourth decile 4. Total data used 1,180 poor household data.

From the data, there are 11 criteria used in the study. Where 8 criteria are used for k-means clustering and 3 criteria for VIKOR. The 8 criteria for grouping are floor type, wall type, roof type, defecation facility, type of closet, final stool disposal, number of individuals in the family and welfare status up to 4th deciles. While 3 criteria for VIKOR are drinking water source, sources of lighting and fuel for cooking.

#### 4.2. Data Mining
Data Mining is an analysis of a set of data to find an unexpected relationship and summarize data differently from the previous one that is useful and understood by the data owner [6].
Data Mining is a part of Knowledge Discovery in Database (KDD). Knowledge Discovery in Database (KDD) is the whole process of searching for and identifying patterns or data information, whereby patterns that are found to be valid, novel, can be useful and understandable. Broadly speaking the KDD process consists of several stages [7].

4.3. Clustering K-Means
Clustering is a method of analyzing data to find a group of sets of objects or individuals that share the same characteristics. Clustering is one method in data mining. In the clustering there are two approaches. The two main approaches are clustering with partition and clustering approaches with a hierarchical approach [8].

K-Means is one of the data clustering methods that partition the data into clusters so that data that have the same characteristics are grouped into the same cluster and data that have different characteristics are grouped into other groups so that the data is in one cluster / group has small variation levels [9].

The steps of the k-means algorithm [10] are:
1. Specify k as the number of clusters to be formed.
2. Generating a random value for the center of the initial cluster (centroid) as much as k.
3. Calculate the distance of each input data on each centroid using the Euclidean Distance formula until it finds the closest distance of each data with the centroid. Here is the Euclidean Distance equation:

\[
(x_i, \mu_j) = \sqrt{((x_i - \mu_j)^2)} \quad (1)
\]

where
- \(x_i\) : data criteria
- \(\mu_j\) : centroid on the j-cluster
4. Classify each data based on its proximity to the centroid (smallest distance).
5. Renew the centroid value. The value of the new centroid is obtained from the average cluster in question with the equation:

\[
\mu_j (t+1) = \frac{1}{N_{Sj}} \sum_{j=Sj} X_j \quad (2)
\]

where:
- \(\mu_j\) (t+1) : new centroid on iteration to (t+1)
- \(N_{Sj}\) : alots of data on cluster Sj
6. Doing looping from steps 2 to 5 until the members of each cluster nothing has changed.
7. If step 6 has been fulfilled, then the value of the cluster center (\(\mu_j\)) in the last iteration will be used as a parameter to determine the data classification.

4.4. Multi Criteria Decision Making (MCDM)
Multi criteria decision making (MCDM) is a decision-making technique from several alternative options. Inside the MCDM it contains elements of attributes, objectives, and objectives [14].
- Attributes describe, characterize an object. For example, high, long and so on.
- Objective states the direction of improvement or likability of attributes, such as maximizing age, minimizing prices, and so on. Objectives can also come from attributes that become objective if the attribute is given a specific direction.
- Goals are determined first. For example a project has an objective to maximize profit, then the project has a goal of achieving profit 10 million / month.

There are two categories of multi criteria decision making (MCDM), are:
1. Multiple Objective Decision Making (MODM)
Concerning the design problem, where mathematical optimization techniques are used, for an enormous number of alternatives (up to infinity) and to answer the question what (what) and how much.
2. Multiple Attribute Decision Making (MADM)
Concerning electoral matters, where mathematical analysis is not so much required or can be used for
selection of only a small number of alternatives. The method of Analytical Hierarchy Process (AHP),
Simple Additive Weighting Method (SAW), Technique for Order by Similarity to Ideal Solution
Method (TOPSIS), Višekriterijumsko KOmpromisno Rangiranje (VIKOR) is part of MADM technique.

4.5. Višekriterijumsko KOmpromisno Rangiranje (VIKOR)
Višekriterijumsko KOmpromisno Rangiranje (VIKOR) was developed for multicriteria optimization of
complex systems. VIKOR is used to define rank lists, compromise solutions, and stability interval
weights. For stability, the compromise solution preference is obtained with initial weights. The VIKOR
method has advantages in the rating process by having a preference value for ranking and can handle
the ranking of many alternatives more easily. It also introduces a multi-criteria index-based index at a
special "proximity" size with an "ideal" solution [11].

The calculation steps of VIKOR method [12] [13], are:
1. Calculate the normalized decision matrix. The calculation of the normalized decision matrix against
each data \( L_{ij} \) follows the equation:

\[
 f_{ij} = \frac{L_{ij}}{\sqrt{\sum_{i=1}^{m} L_{ij}^2}} 
\]  

(3)

Where \( i \) is an alternative to 1,2,3 to m, \( j \) is an alternative to 1,2,3 to n. \( X_{ij} \) is the element value of each
criterion and \( f_{ij} \) is the result of normalization. A \( F \) matrix is
obtained which contains the overall value
of the normalized element, shown by the equation

\[
 F = \begin{bmatrix}
 A_1 \\
 A_2 \\
 \vdots \\
 A_m \\
 \end{bmatrix}
\begin{bmatrix}
 C_{x1} & C_{x2} & \cdots & C_{xn} \\
 x_{11} & x_{12} & \cdots & x_{1n} \\
 \vdots & \vdots & \ddots & \vdots \\
 x_{m1} & x_{m1} & \cdots & x_{mn} \\
 \end{bmatrix}
\]  

(4)

2. Determine ideal and negative solutions
Determine the alternative with the highest value which means as a positive solution \((fj*)\). While having
the lowest value would be the ideal negative \((fj-)\). How to determine the values
of \( fj* \) and \( fj- \) through equations:

\[
 fj* = \max_i f_{ij} \\
 fj- = \min_i f_{ij} 
\]  

(5)

3. Calculating Utility Measures
To get the value of \( Si \) and \( Ri \), we need the criteria weighting value. The weight of the criterion \((wj)\) aims
to represent the relative importance. The values of \( Si \) and \( Ri \) are calculated successively by the equations:

\[
 S_i = \sum_{j=1}^{n} w_j \frac{f_j - f_{ij}}{(f_j^* - f_{ij})} 
\]  

(6)

\[
 R_i = \max_j \left[ w_j \frac{(f_j - f_{ij})}{(f_j^* - f_{ij})} \right] 
\]  

(7)

4. Calculating the indeks VIKOR \((Qi)\)
Calculation of VIKOR index using equation

\[
 Q_i = v \frac{S_i - S^*}{S^* - S^-} + (1 - v) \frac{R_i - R^*}{R^* - R^-} 
\]  

(8)

Under the condition:

\[
 S^* = \min_i(S_i) \\
 R^* = \min_i(R_i) \\
 S^- = \max_i(S_i) \\
 R^- = \max_i(R_i) 
\]
To calculate the VIKOR value required, $v$ variable known as the strategic weighting of the majority of criteria, where the default value $d_i$ is set at 0.5.

5. Ranking Utility Measures ($S_i$), Regret Measures ($R_i$) and VIKOR ($Q_i$)

6. Applying a compromise solution

An alternative compromise solution ($A'$) is proposed when the conditions C1 and C2 are met where alternative $A'$ is the first rank in VIKOR rating ($Q_i$). The conditions C1 and C2 as follows:

A. Condition C1: Acceptable Advantage

The acceptable advantage condition is accepted if

$$Q(A^1) - Q(A^2) \geq DQ$$

$$DQ = \frac{1}{n-1}.$$ 

$A^1$ is a first-order alternative to ranking $Q_i$, $A^2$ is the second-order alternative to ranking $Q_i$.

B. Condition C2: Acceptable Stability

To satisfy the condition of C2, alternative $A'$ should also rank first in the rating of $S_i$ and/or $R_i$. If the condition of C2 is met, then another compromise solution may be proposed, ie alternatives $A^1, A^2, \ldots A^n$ where $A^n$ is determined from the relation

$$Q(A^n) - Q(A^1) < DQ$$

for $n$ ie the nearest alternative position.

5. RESULT AND ANALYSIS

At this stage, the data was tested using a system that had been constructed to determine the recipient of a home surgical aid using clustering of k-means and VIKOR. The steps of k-means clustering process as follows.

1. Determining the desired number of clusters. In the system of determining the recipient of home surgery aid will be used 3 clusters of the first cluster (C1), second cluster (C2) and third cluster (C3).

2. Determine the initial value of the cluster center (centroid) at random. The initial value of cluster center (centroid) at random as follows:

   $C_1 = (9; 6; 9; 4; 0; 6; 8; 1)$
   $C_2 = (4; 3; 4; 2; 2; 3; 5; 2)$
   $C_3 = (1; 1; 1; 1; 1; 1; 3; 4)$

3. Calculate the distance from each data to each existing cluster center with euclidean distance to find the closest distance from each data to the centroid.

   The first data distance to the center of the first cluster
   $$d_{11} = \sqrt{(9-(6-9))^2+(6-(6-9))^2+(6-(6-9))^2+\ldots+(1-(1-4))^2)} = 9.433$$

   The first data distance to the center of the second cluster
   $$d_{12} = \sqrt{(4-(6-4))^2+(3-(3-3))^2+(6-(6-4))^2+\ldots+(1-(1-2))^2)} = 7.280$$

   The first data distance to the center of the third cluster
   $$d_{13} = \sqrt{(1-(6-1))^2+(3-(3-1))^2+(6-(6-1))^2+\ldots+(1-(1-4))^2)} = 8.246$$

4. Each data will be allocated to a cluster based on the closest distance from its cluster center.

5. Calculating the new cluster center is done by calculating the average value of each criterion of all members who are members of each cluster. In the first cluster there are 123 data, so the calculation of new cluster as follows

   $C_{11} = (9+9+9+9+6+\ldots+9+9+6)/123 = 931/123 = 7.569$
   $C_{12} = (3+3+3+4+4+\ldots+4+3+4)/123 = 449/123 = 3.650$
C13 = (9+6+9+6+9+.....+9+6+9)/123 = 987/123 = 8.024
So also, for the second and third clusters. So, the value of the new cluster center is
C1= (7.569; 3.650; 8.024; 0.178; 4.121; 4.53; 2.601).
C2= (6.001; 2.687; 6.051; 2.314; 0.931; 2.998; 3.969; 3.300).
C3= (2; 1; 5.933; 1.2; 1; 1.333; 3.6; 3.933).
6. Do iteration from step 2 to step 5 so that members of each cluster nothing changes.
7. If step 6 has been fulfilled, then the value of the cluster center ($\mu_j$) in the last iteration is
C1= (6.355; 2.921; 6.421; 0; 4.124; 3.680; 2.94).
C2= (6.232; 2.745; 6.128; 1.096; 1.623; 2.212; 4.268; 3.478).
C3= (2.040; 1.306; 5.979; 1.897; 0.918; 4.836; 2.448; 3.489).
As well as generating 538 data for the first cluster, 593 data on the second cluster and 49 data in the third cluster can be seen in Table 1, Table 2, and Table 3

| No | Nama       | Cluster |
|----|------------|---------|
| 1  | Timbul Damanik | Cluster 1 |
| 2  | Pagit Saragih  | Cluster 1 |
| 3  | Jaya Putra Saragih | Cluster 1 |
| ... | ....       | ....    |
| 536 | Jumalim     | Cluster 1 |
| 537 | Tukiman     | Cluster 1 |
| 538 | Saripah     | Cluster 1 |

| No | Nama       | Cluster |
|----|------------|---------|
| 1  | Anto Girsang  | Cluster 2 |
| 2  | Sayur Sitepu  | Cluster 2 |
| 3  | Lohe Br Manik | Cluster 2 |
| ... | ....       | ....    |
| 591 | Tumino      | Cluster 2 |
| 592 | Sukiman     | Cluster 2 |
| 593 | Dewi Srian   | Cluster 2 |

| No | Nama       | Cluster |
|----|------------|---------|
| 1  | Supendi    | Cluster 3 |
| 2  | Rasna Br Sitepu | Cluster 3 |
| 3  | Ngadirit   | Cluster 3 |
| ... | ....       | ....    |
| 47 | Sarman Damanik | Cluster 3 |
From the clustering process obtained the following results:

1. The first cluster contains a house that has a type of cement floor; type of wooden wall; type of zinc roof; no defecation facility; no toilet types final disposal of feces in ponds /fields / rivers; has 4 household members; and his welfare status is in the third decile. The state of this house is considered an unworthy house.

2. The second cluster contains a house that has a type of cement floor; type of wooden wall; type of zinc roof; own defecation facility; toilet type is embankment latrine.; final disposal of feces in SPAL; has 4 household members; and the status of his welfare is in the third decile. The condition of this house is considered as a house is because it has had a defecation facility and not too bad.

3. The third cluster contains a house that has a ceramic floor type; type of wall is the wall; type of roof is zinc; joint defecation facility; type of closet is swan neck; final disposal of feces tool in SPAL; has 5 household members, and his welfare status is in the third decile. The state of this house is regarded as an almost feasible house.

After going through the clustering process, then the ranking process with VIKOR with 6 stages. The stages are as follows.

1. Calculating the normality of decision matrix with Table 4 shows alternative data and criteria of the 'not worthy cluster' or cluster 1. The criteria are the source of drinking water (C1), lighting source (C2), and cooking fuel (C3). Then there are alternatives A1 through A538, which is 538 people whose homes are not eligible contained in cluster 1.

| No | Alternatif        | C1 | C2 | C3 |
|----|-------------------|----|----|----|
| 1  | Timbul Damanik    | 9  | 3  | 8  |
| 2  | Pagit Saragih     | 8  | 3  | 8  |
| 3  | Jaya Putra Saragih| 9  | 3  | 8  |
| 4  | Dahlan Sipayung   | 5  | 1  | 8  |
| 5  | Misiem            | 10 | 3  | 8  |
| 6  | Iswandi Tarigan   | 10 | 1  | 8  |
| ...| ...               | ...| ...| ...|
| 536| Jumalim           | 5  | 1  | 3  |
| 537| Tukiman           | 5  | 1  | 3  |
| 538| Saripah           | 5  | 1  | 3  |

To normalize the decision matrix is calculated by equation (3) and the result of the normalization of the decision matrix can be seen in table 5.

| Alternatif | C1 | C2 | C3 |
|------------|----|----|----|
| A1         | 0.055 | 0.098 | 0.050 |
2. Determining ideal and negative solutions can be done using equation (5).

Ideal solution
\[ A^* = \{f_1^*, f_2^*, f_3^*\} \]
\[ = \{0.073; 0.098; 0.056\} \]

Ideal negative
\[ A^- = \{f_1^-, f_2^-, f_3^-\} \]
\[ = \{0.012; 0.032; 0.018\} \]

3. Before calculating Utility Measures first determine the value of \( w \) or weight. The value of \( w \) or the weight given for the drinking water source is 0.4, the source of light is 0.3 and the cooking fuel is 0.3. To calculate Utility Measures (\( S_i \)) and Regret Measures (\( R_i \)) used equations (6) and (7).

\[ S_1 = 0.4 \frac{(0.073 - 0.055)/(0.073 - 0.012) + 0.3 (0.098 - 0.098)/(0.098 - 0.032) + 0.3 (0.056 - 0.050)/(0.056 - 0.018)}{0.17} \]
\[ S_2 = 0.4 \frac{(0.073 - 0.049)/(0.073 - 0.012) + 0.3 (0.098 - 0.098)/(0.098 - 0.032) + 0.3 (0.056 - 0.050)/(0.056 - 0.018)}{0.21} \]

As for the value of \( R_i \) is
\[ R_1 = \text{Max}[0.12; 0.05] \]
\[ R_1 = 0.12 \]
\[ R_2 = \text{Max}[0.16; 0.05] \]
\[ R_2 = 0.16 \]

The calculation results \( S_i \) and \( R_i \) can be seen in Table 6

| Alternatif | \( S_i \) | \( R_i \) |
|------------|----------|----------|
| A1         | 0.17     | 0.12     |
| A2         | 0.21     | 0.16     |
| A3         | 0.17     | 0.12     |
| A4         | 0.63     | 0.3      |
| A5         | 0.47     | 0.3      |
| A6         | 0.13     | 0.08     |
4. To calculate the index VIKOR used equation (8), where the VIKOR index selected to be the best solution is with the smallest value.

\[
Q_1 = 0.5\left[\frac{(0.17 - 0.08)}{(1 - 0.08)}\right] + (1-0.5) \left[\frac{(0.12 -0.08)}{(0.4 - 0.08)}\right]
\]
\[
Q_1 = 0.5[0.09/0.92] + 0.5 [0.04/0.32]
\]
\[
Q_1 = 0.1114
\]

\[
Q_2 = 0.5\left[\frac{(0.21 - 0.08)}{(1 - 0.08)}\right] + (1-0.5) \left[\frac{(0.16 -0.08)}{(0.4 - 0.08)}\right]
\]
\[
Q_2 = 0.5[0.13/0.92] + 0.5 [0.08/0.32]
\]
\[
Q_2 = 0.1956
\]

5. After each value \(S_i\), \(R_i\) and \(Q_i\) are obtained, then the next step is to sort the values of \(S_i\), \(R_i\) and \(Q_i\) based on the minimum value. So, obtained three rankings. The sorting results \(S_i\), \(R_i\) and \(Q_i\) can be seen in Table 7.

### Table 7. Sorting Results of \(S_i\), \(R_i\) and \(Q_i\)

| Alternative | \(S_i\) | \(R_i\) | \(Q_i\) |
|-------------|--------|--------|--------|
| A1          | 0.17   | 10     | 0.12   | 27     | 0.11   | 14     |
| A2          | 0.21   | 33     | 0.16   | 35     | 0.19   | 35     |
| A3          | 0.17   | 24     | 0.12   | 29     | 0.14   | 24     |
| A4          | 0.63   | 330    | 0.3    | 363    | 0.64   | 350    |
| A5          | 0.47   | 131    | 0.3    | 364    | 0.55   | 135    |
| A6          | 0.13   | 4      | 0.08   | 4      | 0.02   | 4      |
| A536        | 0.88   | 456    | 0.3    | 198    | 0.77   | 443    |
| A537        | 0.88   | 453    | 0.3    | 196    | 0.77   | 445    |
| A538        | 0.88   | 454    | 0.3    | 197    | 0.77   | 436    |

6. After the sorting of \(S_i\), \(R_i\) and \(Q_i\) then next make a compromise proposal. So, the proposed compromise 'not worthy cluster' or cluster 1 using acceptable advantage (9) is.

\[
Q(A2) - Q(A1) \geq DQ
\]
\[
0.0271 - 0 \geq 1/(538-1)
\]
\[
0.0271 \geq 0.0018 \text{ (diterima)}
\]

From the results of the 'not worthy cluster' to use VIKOR got the A58 in the first sequence, A333 in second, A518 in third, A6 is fourth, A517 is fifth, A48 in the sixth sequence until A173 is in last order or sequence to 538.

For the results of the ranking on the 'medium cluster' obtained A119 in the first sequence, A76 in second, A77 in third, A130 is in fourth, A143 is fifth, A326 in sixth place until A9 is in last order or order to 593.
The result of ranking in 'almost feasible cluster' got A16 at first, A48 in second, A49 in third, A45 in fourth, A24 fifth, A13 in sixth until A42 is in last order or 49th. To receive a house improvement in the first year will be given to 185 poor households (RTM). Thus, 185 RTM names will be taken from the rankings in the 'not worthy cluster'. Then in the second year, the house improvement was given to 162 RTM taken from 'not worthy cluster' ranging from 186th rank to 347th rank. In the third year, was given to 300 RTM with 191 names from rank 348 to 538 rankings on 'not worthy cluster' and 109 names of the 'medium cluster'. In the fourth year will be given to 250 RTM, the fifth year to 150 RTM and the sixth year to 133 RTM. A total of 6 years of house improvement will be provided to 1,180 RTM in Serdang Bedagai which can be seen in Figure 2.

![Figure 2. Number of Recipient per Year](image)

6. Conclusion
The conclusions that can be taken based on testing of the determination system of the recipient of home surgery aid in Serdang Bedagai Regency using clustering method of k-means and VIKOR are as follows:

1. Based on the results of research using clustering method k-means, grouping to the state of the house that can have the right to help there are 3 clusters. The ineligible cluster is a very uninhabitable home state, then the cluster is in a better home state than the previous cluster and the last cluster is almost feasible that the state of the house is better than the state of the cluster being.

2. VIKOR method is proven to help the ranking process. Because it can make alternative compromise ranking from a few alternatives.

3. Poor households in the cluster are not worthy to show their home situation is so bad that it is very necessary to get home surgery assistance provided by the government.

7. References
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