Analysis Using Treesoft Set of the Strategic Development Plan for Extreme Poverty Municipalities

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Abstract. The analysis of the Strategic Development Plan for extreme poverty municipalities in the Province of Huancayo, Peru in 2019 using Treesoft Set and neutrosophic sets represents an innovative and rigorous approach to evaluate development strategies in challenging socioeconomic contexts. In this study, advanced data analysis and uncertainty management tools are used to thoroughly examine the actions proposed in the strategic plan and their potential impact on the most vulnerable communities. The combination of Treesoft Set, a comprehensive platform for data analysis, and neutrosophic sets, which allow the modeling of imprecision and ambiguity in collected data and opinions, offers a robust methodology to address the complexity inherent in planning and executing strategy strategies. development in municipalities with high levels of poverty.This analysis seeks to identify both the strengths and possible areas of improvement of the Strategic Development Plan, providing an objective and well-founded basis for decision-making in public policies aimed at reducing poverty and promoting sustainable development. By exploring the multiple dimensions of socioeconomic development through the application of Treesoft Set and neutrosophic sets, this study aims to contribute to the design of more effective interventions adapted to the specific needs of extreme poverty municipalities in the Province of Huancayo. This methodological approach has the potential to generate significant insights that can inform and improve local development strategies, thus promoting a positive and lasting impact on the living conditions of the most vulnerable populations.

Keywords: Treesoft Set, Neutrosophic Set; Strategic Development Plan

1 Introduction

This investigation begins, after becoming aware of the report provided by the National Center for Strategic Planning, hereinafter CEPLAN, on the province of Huancayo, capital of the Junín Region. , in its 2017 Report where extreme poverty districts are cataloged Pariahuanca , Chacapampa , Santo Domingo de Acobamba , Cullhuas , Huasicancha , Carhuacallanga , Chongos Alto, Pucara (heroic city), Colca and Chicche , although the city of Huancayo is classified as one of the leading cities in economic growth in the central region of the country [1].

Given the lack of professionals with government experience to provide their services ad honorem to these local governments, there is a conviction of the need to propose a Strategic Development Plan model, that is, to achieve better management in the Extreme Poverty Municipalities of the Province of Huancayo [2].

Similarly, in Peru, the decentralization process is based on economic and administrative autonomy in the management of district municipalities, and the Public Budget Law establishes guidelines for the formulation of short and long-term plans, which cannot be applied in local governments living in extreme poverty. Therefore, this article describes the strategic lines for the development of these municipalities. The same will be evaluated and updated every four (04) years, by the representative actors of the municipality, to eradicate extreme poverty in its population [3].

However, the application of these standards has not been possible, due to the municipal management of local governments of extreme poverty [4]. That is why this thesis research work is proposed as an instrument that provides strategic lines for the development of these municipalities. The same will be evaluated and updated every four (04) years, by the representative actors of the community recognized by the District Municipality of extreme poverty. It must monitor them as well as make continuous improvements and also articulate efforts to take advantage of the predominant natural resources in each of them.

In this paper, we utilized the MCDM [5] methodology to examine the strategic development plan for extreme poverty municipalities in the province of Huancayo, Peru. To facilitate this evaluation, we employed Treesoft Set and neutrosophic sets as analytical tools. By applying the MCDM methodology, we evaluated a variety of criteria and used the VIKOR[6] method to rank the available alternatives. The integration of MCDM methodology with neutrosophic sets addressed the uncertainty inherent in the evaluation process, combining them with the Treesoft Set. The participation of three decision-makers and experts was instrumental in classifying the criteria and options, opting to use BNN over the opinions expressed by the experts. Utilizing the VIKOR method, we created three decision matrices, each providing defined values that were combined to form a final matrix. This study focused on the evaluation of 12 criteria and 10 alternatives, aiming to ensure a greater allocation of economic resources from the MEF and improve municipal management and tax collection strategies.

2. Related Work

An interval valued neutrosophic set (IVNS) is defines as

Definition 1[6]:

Let Y be a universe of discourse with a generic element in Y denoted by y. We can define the neutrosophic variable y as $y = (T, I, F)$ where T, I and F refer to the degrees of truth, indeterminacy and falsity.

$$0 \le \sup \ (T(y)) + \sup(I(y)) + \sup(F(y)) \le 3 \tag{1}$$

We can define the IVNS as:

$$y = [\ T^L \ T^U\ ], [\ I^L, I^U\ ], [\ F^L, F^U\ ] \tag{2}$$

Definition 2

We can define bipolar neutrosophic sets (BNS) [7] :

$$A = \{< x, T^+(x), I^+(x), F^+(x), T^-(x), I^-(x), F^-(x) > \} \tag{3}$$

$$T^+, I^+, F^+ : X \to [0,1] \text{ and } T^-, I^-, F^- : X \to [0,1]$$

The positive membership degree represents the truth, indeterminate, and false membership of an element with respect to a bipolar neutrosophic set. Conversely, the negative membership degree signifies the truth, indeterminate, and false membership of the same element related to some implicit counter property corresponding to the bipolar neutrosophic set [8, 9].

Let U universe of discourse and H a non-empty subset of, with $P(H)$ *be a powerset of H*[10, 11] .

Let TSR a set of attributes of the problem (criteria),

$$TSR = \{TSR_1, TSR_2, \dots, TSR_n\}, n \ge 1 \tag{4}$$

Where $TSR_1, TSR_2, \dots, TSR_n$ are criteria from the first level of the tree.

Each attribute TSR_1, $1 \leq i \leq n$, $is\ formed\ by\ subattributes$:

$TSR_1 = \{ TSR_{1,1}, TSR_{1,2} \ldots, \}$

$TSR_2 = \{ TSR_{2.1}, TSR_{2.2} \ldots, \}$

$TSR_n = \{ TSR_{n,1}, TSR_{n,2} \ldots, \}$

Where $TSR_{i,j}$ They are sub attributes.

Tree TreeSoft Set [12] can be as:

$$F: P\ (Tree\ (TSR\ )) \rightarrow P\ (H\ ) \tag{5}$$

$$Tree\ (SR\ ) = \{ TSR_i | i_1 = 1,2,3,\ldots \} \cup \{ TSR_i | i_1, i_2 = 1,2,3,\ldots \} \cup \{ TSR_i | i_1, i_2, i_3 = 1,2,3,\ldots \} \cup \ldots$$
$$\cup \{ TSR_i | i_1, i_2, \ldots i_m = 1,2,3,\ldots \} \tag{6}$$

3. Material and Methods

The methodology employed using the neutrosophic TreeSoft Set with the VIKOR method used in this paper is presented below (Figure 1).
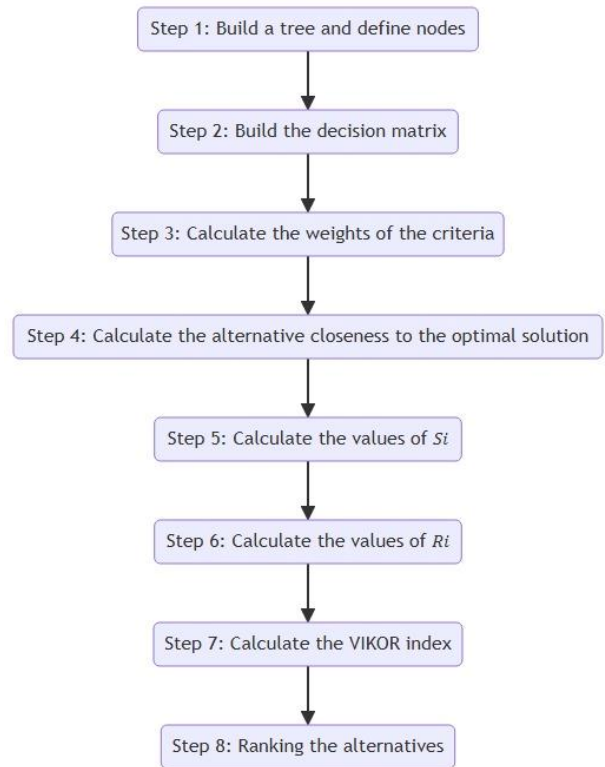

Figure 1. TreeSoft Set with the VIKOR method

Step 1. Build a tree and define nodes [11,12]

The tree has more than one level, at the first level, the main criteria are entered as $SWM_1, SWM_2 \ldots, SWM_n$

At the second level, the sub-criteria are introduced as $SWM_{1.1}, SWM_{1.2}, \ldots$ And $SWM_{2.1}, SWM_{2.2}, \ldots$

Step 2. Build the decision matrix

The decision matrix is constructed using information from decision makers and experts between criteria and alternatives.

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix}; \ i=1,2,\ldots,m; j=1,2,\ldots,n \tag{7}$$

Step 3. Calculate the weights of the criteria.

Criteria weights are calculated using the average method.
$$\sum_{j=1}^{n} w_j = 1 \tag{8}$$
Step 4. Calculate the alternative closeness to the optimal solution.

$$U_i = \left\{ \sum_{j=1}^{n} \left[\frac{w_j(r_j{}^* - r_{ij})}{(r_j{}^* - r_j{}^-)} \right]^p \right\}^{\frac{1}{p}} \tag{9}$$

Where r_j is the best and $r_j{}^-$ correspond to the best and worst alternative of the system, respectively

Step 5. Calculate the values of S_i
$$S_i = \sum_{j=1}^{n} w_j \frac{(r_j^* - r_{ij}^-)}{(r_j^* - r_j^-)} \ i=1,2,\ldots,m, \ j=1,2\ldots,n \tag{10}$$

Step 6. Calculate the values of R_i

$$R_i = \max_j \left[w_j \frac{(r_j^* - r_{ij}^-)}{(r_j^* - r_j^-)} \right] \ i=1,2,\ldots,m, \ j=1,2\ldots,n \tag{11}$$

Step 7. Calculate the VIKOR index[14].

$$Q_i = t * \left[\frac{S_i - S^*}{S^- - S^*} \right] + (1+t) * \left[\frac{R_i - R^*}{R^- - R^*} \right] \ i=1,2,\ldots,m, \ j=1,2\ldots,n \tag{12}$$
$$S^* = \min_i S_i, S^- \max_i S_i, R^* = \min_i R_i, R^- \max_i R_i$$

Where $t = 0.5$

Step 8. Classify the alternatives.

Alternatives are classified as descending values of Q_i

4. Case Study

This section presents the outcomes of the TreeSoft analysis combined with the BNS and VIKOR methods. The study utilized 8 criteria and 8 alternatives, as illustrated. Three experts evaluated these criteria and alternatives using bipolar neutrosophic numbers (BNNs).

1. **Local Economic Development Programs:** Implement programs that promote economic diversification and local entrepreneurship, including business training, access to microcredit, and support for small businesses.
2. **Promotion of Education and Training:** Develop educational and job training programs that strengthen the skills of the population to access better employment and entrepreneurship opportunities.
3. **Access to Health Services:** Establish health centers and health care programs that improve access to basic and specialized health services for the vulnerable population.
4. **Affordable Housing Development:** Implement social housing projects that provide adequate and affordable housing solutions for low-income families.
5. **Basic Infrastructure Improvement:** Prioritize infrastructure projects that improve access to basic services such as drinking water, sanitation, electricity, roads and public transportation.
6. **Environmental Preservation and Sustainable Development:** Promote environmental conservation practices and sustainable management of natural resources, including reforestation programs, sustainable agriculture and waste management.
7. **Strengthening Community Participation:** Encourage active community participation in decision-making and project execution, through the creation of local committees and inclusive dialogue spaces.
8. **Promotion of Sustainable Tourism:** Develop strategies to take advantage of local tourism potential in a sustainable manner, promoting ecotourism and the valorization of local culture as a source of income.

Evaluation criteria:

1. **Impact on poverty reduction:** Evaluate to what extent the strategic plan has contributed to the effective reduction of poverty in the municipality, considering indicators such as the decrease in the multidimensional poverty index and the improvement in the living conditions of the population. vulnerable.
2. **Inclusion and community participation** : Analyze whether the plan has promoted the active participation of the local community in the identification of needs, design of strategies and decision making, ensuring the inclusion of marginalized or excluded groups.
3. **Sustainability and resilience:** Evaluate the sustainability of the actions proposed in the strategic plan, considering aspects such as the efficient use of natural resources, the promotion of environmentally sustainable practices and the community's capacity to face future challenges.
4. **Access to basic services** : Verify whether the plan has improved the population's access to essential services such as health, education, drinking water, basic sanitation and adequate housing, especially in areas where there are significant deficits.
5. **Local economic development:** Analyze the impact of the plan on the generation of employment, the promotion of sustainable economic activities, the diversification of the local economy and the strengthening of the business capabilities of the population.
6. **Governance and transparency:** Evaluate the effectiveness of the governance mechanisms implemented for the execution of the plan, including transparency in the allocation of resources, accountability and the participation of key actors.
7. **Institutional capacities:** Measure the strengthening of local institutional capacities to plan, implement, monitor and evaluate development programs and projects, including intersectoral coordination and effective resource management.
8. **Monitoring and evaluation:** Analyze the existence of adequate monitoring and evaluation systems that allow measuring progress and results achieved based on specific indicators, facilitating informed decision-making and continuous adaptation of the plan.

This section shows the results of TreeSoft with the BNS and VIKOR methods. This study used 8 criteria as shown and 8 alternatives. Three experts used bipolar neutrosophic numbers (BNN) to evaluate the criteria and alternatives.

Step 1. Build a tree and define the nodes.

The tree has more than one level, at the first level, the main criteria are entered as
$SWM_1, SWM_2 \dots, SWM_n$

At the second level, the sub-criteria are introduced as $SWM_{1.1}, SWM_{1.2},\dots$ And $SWM_{2.1}, SWM_{2.2},\dots$

Step 2. Construct the decision matrix using Eq. (8). Table 1 shows the decision matrix.

Table 1. The decision matrix.

	SWM1	SWM2	SWM3	SWM4	SWM5	SWM6	SWM7	SWM8
ALT 1	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]
ALT 2	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]
ALT 3	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]
ALT 4	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]
ALT 5	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,6O, O,6O, O,6O, −0,6O, −0,6O, −0,6O]	[O,7O, O,6O, O,6O, −0,4O, −0,7O, −0,7O]	[O,6O, O,6O, O,6O, −0,6O, −0,6O, −0,6O]	[O,6O, O,6O, O,6O, −0,6O, −0,6O, −0,6O]	[O,4O, O,2O, O,5O, O,6O, −0,2O, −0,1O]	[O,6O, O,6O, O,6O, −0,6O, −0,6O, −0,6O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]
ALT 6	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,6O, O,6O, O,6O, −0,6O, −0,6O, −0,6O]	[O,9O, O,1O, O,1O, −0,4O, −0,7O, −0,9O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,1O, O,7O, O,5O, −0,9O, −0,2O, −0,1O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]	[O,4O, O,2O, O,5O, −0,6O, −0,2O, −0,1O]
ALT 7	[O,9O, O,1O, O,1O	[O,1O, O,7O, O,5O,	[O,4O, O,2O, O,5O,	[O,7O, O,6O, O,6O,	[O,4O, O,2O, O,5O	[O,4O, O,2O, O,5O	[O,4O, O,2O, O,5O	[O,1O, O,7O, O,5O,

	SWM1	SWM2	SWM3	SWM4	SWM5	SWM6	SWM7	SWM8
	−O,4O, −O,7O, −O,9O]	−O,9O, −O,2O, −O,1O]	−O,6O, −O,2O, −O,1O]	−O,4O, −O,7O, −O,7O]	, −O,6O, −O,2O, −O,1O]	O,6O, −O,2O, −O,1O]	, −O,6O, −O,2O, −O,1O]	−O,9O, −O,2O, −O,1O]
ALT 8	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,1O, O,7O, O, , −O,9O, −O,2O, −O,1O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, O,4O, −O,7O, −O,9O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]
	SWM1	SWM2	SWM3	SWM4	SWM5	SWM6	SWM7	SWM8
ALT 1	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.40, 0.20, 0.50 , 0.50, −0.20, − 0.10]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]
ALT 2	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.70, 0.50, 0.50 , 0.40, −0.70, − 0.70]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]
ALT 3	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.90, 0.10, 0.10 , 0.40, −0.70, − 0.90]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]
ALT 4	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.10, 0.70, 0.50 , 0.90, −0.20, − 0.10]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]
ALT 5	[0.10, 0.70, 0.50 , −0.90, −0.20, − 0.10]	[0.50, 0.50, 0.50 , −0.50, −0.50, − 0.50]	[0.70, 0.50, 0.50 , −0.40, −0.70, − 0.70]	[0.50, 0.50, 0.50 , −0.50, −0.50, − 0.50]	[0.50, 0.50, 0.50 , −0.50, −0.50, − 0.50]	[0.40, 0.20, 0.50 , 0.50, −0.20, − 0.10]	[0.50, 0.50, 0.50 , −0.50, −0.50, − 0.50]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]
ALT 6	[0.90, 0.10, 0.10 , −0.40, −0.70, − 0.90]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.50, 0.50, 0.50 , −0.50, −0.50, − 0.50]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.10, 0.70, 0.50 , .90, −0.20, − 0.10]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]	[0.40, 0.20, 0.50 , −0.50, −0.20, − 0.10]

	SWM1	SWM2	SWM3	SWM4	SWM5	SWM6	SWM7	SWM8
ALT 7	[0.90, 0.10, 0.10, −0.40, −0.70, −0.90]	[0.70, 0.50, 0.50, −0.40, −0.70, −0.70]	[0.40, 0.20, 0.50, −0.50, −0.20, −0.10]	[0.70, 0.50, 0.50, −0.40, −0.70, −0.70]	[0.70, 0.50, 0.50, −0.40, −0.70, −0.70]	[0.40, 0.20, 0.50, 0.50, −0.20, −0.10]	[0.70, 0.50, 0.50, −0.40, −0.70, −0.70]	[0.10, 0.70, 0.50, −0.90, −0.20, −0.10]
ALT 8	[0.10, 0.70, 0.50, −0.90, −0.20, −0.10]	[0.90, 0.10, 0.10, −0.40, −0.70, −0.90]	[0.10, 0.70, 0.50, −0.90, −0.20, −0.10]	[0.90, 0.10, 0.10, −0.40, −0.70, −0.90]	[0.90, 0.10, 0.10, −0.40, −0.70, −0.90]	[0.90, 0.10, 0.10, 0.40, −0.70, −0.90]	[0.90, 0.10, 0.10, −0.40, −0.70, −0.90]	[0.70, 0.50, 0.50, −0.40, −0.70, −0.70]
	SWM1	SWM2	SWM3	SWM4	SWM5	SWM6	SWM7	SWM8
ALT 1	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,4O, O,2O, O,5O, O,6O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]
ALT 2	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,7O, O,6O, O,6O, O,4O, −O,7O, −O,7O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]
ALT 3	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, O,4O, −O,7O, −O,9O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]
ALT 4	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,1O, O,7O, O,5O, O,9O, −O,2O, −O,1O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]
ALT 5	[O,1O, O,7O, O,5O, −O,9O, −O,2O, −O,1O]	[O,6O, O,6O, O,6O, −O,6O, −O,6O, −O,6O]	[O,7O, O,6O, O,6O, −O,4O, −O,7O, −O,7O]	[O,6O, O,6O, O,6O, −O,6O, −O,6O, −O,6O]	[O,6O, O,6O, O,6O, −O,6O, −O,6O, −O,6O]	[O,4O, O,2O, O,5O, O,6O, −O,2O, −O,1O]	[O,6O, O,6O, O,6O, −O,6O, −O,6O, −O,6O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]
ALT 6	[O,9O, O,1O, O,1O, −O,4O, −O,7O, −O,9O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,6O, O,6O, O,6O, −O,6O, −O,6O, −O,6O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,1O, O,7O, O,5O, , −O,2O, −O,1O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]	[O,4O, O,2O, O,5O, −O,6O, −O,2O, −O,1O]
ALT 7	[O,9O, O,1O, O,1O	[O,7O, O,6O, O,6O	[O,4O, O,2O, O,5O	[O,7O, O,6O, O,6O	[O,7O, O,6O, O,6O	[O,4O, O,2O, O,5O	[O,7O, O,6O, O,6O	[O,1O, O,7O, O,5O

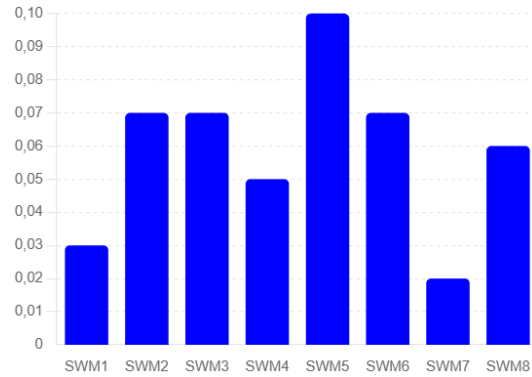|	$SWM1$	$SWM2$	$SWM3$	$SWM4$	$SWM5$	$SWM6$	$SWM7$	$SWM8$
	, −0,40, −0,70, −0,90]	, −0,40, −0,70, −0,70]	, −0,60, −0,20, −0,10]	, −0,40, −0,70, −0,70]	, −0,40, −0,70, −0,70]	, 0,60, −0,20, −0,10]	, −0,40, −0,70, −0,70]	, −0,90, −0,20, −0,10]
ALT 8	[0,10, 0,70, 0,50, −0,90, −0,20, −0,10]	[0,90, 0,10, 0,10, −0,40, −0,70, −0,90]	[0,10, 0,70, 0,50, −0,90, −0,20, −0,10]	[0,90, 0,10, 0,10, −0,40, −0,70, −0,90]	[0,90, 0,10, 0,10, −0,40, −0,70, −0,90]	[0,90, 0,10, 0,10, 0,40, −0,70, −0,90]	[0,90, 0,10, 0,10, −0,40, −0,70, −0,90]	[0,70, 0,60, 0,60, −0,40, −0,70, −0,70]

Figure 2. The weights of the criteria.

Step 3. Calculate the criteria weights as shown in Figure 3.

Step 4. Calculate the alternative closeness to the optimal solution using Eq. (fifteen).

Step 5. Calculate the values of S_i using the equation. (18).

Step 6. Calculate the values of R_i using the equation. (19).

Step 7. Calculate the VIKOR index using Eqs . (20 and 21)

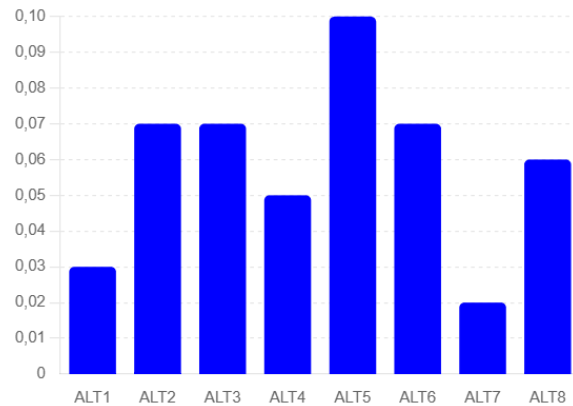Step 8. Rank the alternatives as shown in Figure 4.

Figure 3. The VIKOR index values.

Alternative 5 is the best: **Basic Infrastructure Improvement:** Prioritize infrastructure projects that improve access to basic services such as drinking water, sanitation, electricity, roads and public transportation.

Alternative 7 is the worst: **Strengthening Community Participation:** Encourage active community participation in decision-making and project execution, through the creation of local committees and inclusive dialogue spaces.

3. Conclusions

In this analysis, the MCDM methodology was used to examine the strategic development plan for extreme poverty municipalities in the province of Huancayo, Peru. To carry out this evaluation, Treesoft Set was used together with neutrosophic sets as analysis tools. The MCDM methodology was applied to evaluate a variety of criteria and the VIKOR method was used to rank the various alternatives available. The MCDM methodology was integrated with neutrosophic sets to address the uncertainty inherent in the evaluation process, combining them with the TreeSoft Set. Three decision makers and experts participated in the classification of criteria and options, and it was decided to use BNN instead of the opinions expressed by the experts. Using the VIKOR method, three decision matrices were created that provided defined values in each, which were combined to form a final matrix. This study was based on the evaluation of 12 criteria and 10 alternatives.

The district municipalities of extreme poverty in the province of Huancayo already have a Strategic Development Plan, the implementation of which will be essential to improve municipal management and reduce extreme poverty. When implementing a Strategic Development Plan, it is essential to fully consider the guidelines to improve management control in these municipalities. The objectives outlined in the Strategic Development Plan must be adequately defined by the extreme poverty municipalities of Huancayo to ensure a greater allocation of economic resources from the MEF. It is necessary for these municipalities to establish easy-to-implement strategies that can be integrated into the Strategic Development Plan and contribute positively to improving the collection of taxes and tributes.

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