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Neutrosophic sociodemographic diagnosis of street vending in zone 8 of Ecuador

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Abstract. Street vending is both a social problem and an economic alternative in Ecuador today and for its control, it requires political, social, and economic regulations. That is why it is necessary to start the analysis of the problem with the characterization of the population linked to the activity. It is intended that once the data is obtained, a deep and accurate diagnosis can be initiated for the development of the necessary regulations. The research presented includes a sociodemographic study in zone 8 related to street vending. Its development is based on techniques of a neutrosophic nature (Neutrosophic Cognitive Map and TOPSIS) cognizance this science is suitable for the analysis of social phenomena. We obtained as the proposal of solutions the possible course of action.

Keywords: street vending, sociodemographic diagnosis, Neutrosophy.

1. Introduction

Street vendors and people who bet on the streets represent, according to formal merchants, an inconvenience that has not been controlled [1]. Research on the problem of informal commerce and street vending describes that this phenomenon is preceded by variables such as unemployment, immigration, and the influx of people [2]. This is how the increase in the need to satisfy the consumption of social groups catalyzes the phenomenon of street supply and demand, within this, street vendors, walking vendors, and vendors in vehicles adapted for the sale of products, in addition to stationary ones, which offer products and services in a specific public place [3].

The deterioration of the labor market is reflected in the many signs on the business doors saying that there are no vacancies, but the official figures do not yet measure the precariousness. Until December 2019, 46.7% of the country's employees were in the informal sector of the economy; that is, in that field that does not offer job guarantees for people who have become part of weak businesses that operate without proper papers. Today, amid the consequences of the pandemic, the country still does not know details about the informal market made up mainly of street vendors.[4].

In Zone 8, made up of Guayaquil, Durán, and Samborondón, this phenomenon is repeated and is becoming more frequent, the participation of subjects involved in this activity, especially in areas with a lot of traffic, mainly after the negative impact of Covid-19 on the economy. In addition, many opt for this type of work activity and do not submit to what is legally required by a community authority, which creates conflicts. That is why it is necessary to study this social phenomenon from a sociodemographic perspective to provide political, academic, and government decision-makers with relevant information that allows recommending future actions to mitigate adverse effects.

For the development of this research, the following are set out as specific objectives:

1. Present a summary of the state of the art and the practice of the referred problem.
2. Carry out a sociodemographic study:

    a) Apply surveys to experts and actors of the problem to determine variables of interest.
    b) Evaluate the behavior of the variables of interest in groups for each of the areas using a neutrosophic multicriteria decision method.

3. Enunciate possible courses of action according to the results obtained

The importance of the research lies in the fact that if the current state of the variables of interest in each study area (Guayaquil, Durán, and Samborondón) are determined, corrective actions can be taken. Thus guaranteeing that they are in accordance with the specific needs of each region, contextualizing the course of action.

2 Research background

2.1 Conceptualization

- In [5], it is established that "retail trade on public roads is the name given to the activity of people, who are dedicated to the sale of products and the provision of services of various kinds".
- According to [6], itinerant commerce can be defined as "the commercial activity of retail sale carried out in public places without a permanent commercial establishment that uses removable, transportable or mobile facilities".
- According to what was stated by [7], the street vendor is defined as a person who “sells goods and services for commercial transactions, without obtaining permits, giving receipts or paying taxes”.
- According to the types of street vending, these can be categorized according to four attributes, which are:
  - the types of products offered,
  - the geographical location where they offer their products,
  - the infrastructure used for the sale and
  - the level or degree of informality in which they work.

2.2 Current situation

The Central Bank of Ecuador forecasts that the country will grow 2.54% in 2022, a rate that would be in the average of other projections, including that of the IMF (3.5%) that looks like the most optimistic compared to that of ECLAC (2.6%) and the World Bank (1.4%). Although that would be the optimistic scenario, in a moderate scenario several economists agree that the Ecuadorian GDP could grow by 2%, and in an optimistic scenario, the maximum growth would reach 3%. In 2020, Ecuador recorded its worst fall, registering a GDP contraction of -7.8%, the largest in its history. Therefore, returning to pre-pandemic levels becomes a complex task.[8]. The results of the Ecuadorian Institute of Statistics and Censuses, which revealed that the country's unemployment rate had grown from 3.8% to 13.3% after the health crisis, still do not reflect the other side of job insecurity: the of people who become part of the informal market [4].

Informal commerce, a consequence of the high unemployment that exists in the country, is very noticeable in the streets, sidewalks, and public thoroughfares to many people in informal employment, seeking sustenance for their families, people overwhelmed by poverty and jobs that do not cover their basic needs; and they choose to carry out this activity that does not comply with what is legal that the law of a state requires. The street offers a way out of their situation for those who are heads of households to provide better sustainability and thus overcome the crisis that welcomes them [3]. However, according to [9], many of those involved in this type of sale are satisfied with their way of working. Because of those issues, an increase in this type of trade is forecast for 2022.

One of the problems highlighted in the city is that there is a lot of competition with the informal and that is complicated because there are people who find it easier to buy on the go than to go to a local. These people do not pay taxes, the merchandise is usually contraband, and that further impedes the long-awaited recovery[one]. Together with the social situation due to the social protests that have been announced by the indigenous movement and others slow down the recovery process of the country and its economy.

3 Methodology

It is intended to develop exploratory-descriptive research under a quantitative approach [10]. Since it is the methodology that will allow exploring the phenomenon in the area of influence. This phenomenon has been little studied in depth. While from the descriptive type it is intended to provide descriptions of the sociodemographic variables on which decisions can be made. Which exposes its conductive thread as follows:

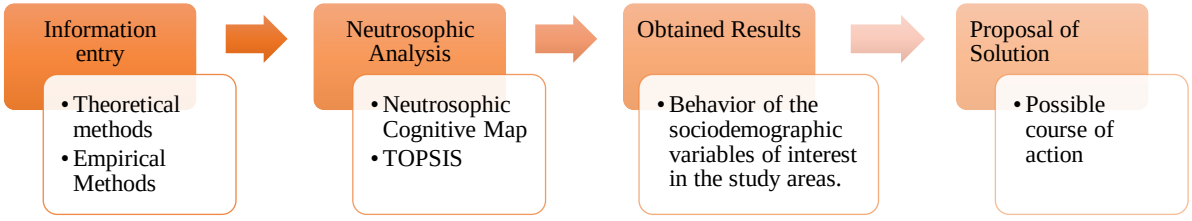

Figure 1: Research thread.

Theoretical methods:

- Analysis and Synthesis of the information obtained from the literature review, as well as the experience of

specialists and workers, consulted to develop conclusions.

- Systemic - structural for the development of the analysis of the system and the evaluation of the context, through its decomposition in the elements that integrate it.

Empirical methods:

- Information gathering: direct observation, document review, expert consultation to reach consensus, group work (brainstorming and group dynamics),
- Information processing: Neutrosophic Cognitive Map and TOPSIS

3.1 Neutrosophic Cognitive Map

Neutrosophic cognitive maps are a generalization of fuzzy cognitive maps. Fuzzy cognitive maps are introduced by Axelrod, see [11], where nodes represent concepts or variables in a particular area of study and arcs indicate either positive or negative influences, and which are considered like causal relationships. They have been applied in various areas, especially in supporting decision-making and in the analysis of complex systems as it is referred to in [12]. Static analysis in a cognitive neutrosophic map focuses on the selection of the most important concepts, characteristics, or factors in the modeled system [13]. The measures described below are used in the proposed model, they are based on the absolute values of the adjacency matrix [14]:

- Outdegree (v_i) is the sum of the row elements in the neutrosophic adjacency matrix. It reflects the strength of the outgoing relationships (c_{ij}) of the variable.

$$od(v_i) = \sum_{i=1}^{n} c_{ij} \quad (1)$$

- Indegree (v_i) is the sum of the column elements. It reflects the strength of relations (c_{ij}) outgoing from the variable.

$$id(v_i) = \sum_{i=1}^{n} c_{ji} \quad (2)$$

- Total centrality (total degree $td\ (vi)$), is the sum of the indegree and the outdegree of the variable.

$$td(v_i) = od(v_i) + id(v_i) \quad (3)$$

The static analysis is applied using the adjacency matrix, taking into consideration the absolute value of the weights [13]. Static analysis in Neutrosophic Cognitive Maps (NCM), see [15], initially contains the neutrosophic number of the form (a + bI, where I = indetermination) [16]. It requires a process of de-neutrosophication as proposed in [14], where I ∈ [0, 1] and it is replaced by their values maximum and minimum. Finally, we work with the average of the extreme values, which is calculated using Equation 5, which is useful to obtain a single value as it is referred to in [17].

$$\lambda([a_1, a_2]) = \frac{a_1 + a_2}{2} \quad (4)$$

Then,

$$A \succ B \Leftrightarrow \frac{a_1 + a_2}{2} > \frac{b_1 + b_2}{2} \quad (5)$$

3.2 TOPSIS

In the case of TOPSIS, the selection is based on finding the alternative that is closest to the ideal solution and, in turn, is further away from the worst solution. It was developed by Hwang and Yoon in 1981 and is based on the concept that a given alternative should be located at the shortest distance from an ideal alternative that represents the best (positive ideal or simply ideal), and at the greatest distance. distance from an ideal alternative that represents the worst (negative ideal or anti-ideal). This method had its evolution towards Neutrosophia, therefore, in this article, linguistic terms will be associated with Single Valued Neutrosophic Numbers (SVNN), in such a way that the experts can carry out their evaluations in linguistic terms, which results in more natural.

Definition 1. Let X be a universe of discourse. A Neutrosophic Set (NS) is characterized by three membership functions[18], $u_A(x), r_A(x), v_A(x): X \rightarrow]-0,1+[$, which satisfy the condition $-0 \leq inf u_A(x) + inf r_A(x) + inf v_A(x)\ sup\ u_A(x) + sup\ r_A(x) + \sup v_A(x) \leq 3^+$ for all $x \in X$. $u_A(x), r_A(x)\ and\ v_A(x)$ denote the true, indeterminate, and false membership functions of x in A, respectively, and their images are standard or nonstandard subsets of $]-0,1+[$. [19].

Definition 2. Let X be a universe of discourse. A Single Value Neutrosophic Set (SVNS) A over X is an object of the form:

$$A = \{\langle x, u_A(x), r_A(x), v_A(x)\rangle : x \in X\} \quad (6)$$

where $u_A, r_A, v_A: X \rightarrow [0,1]$, satisfy the $0 \leq u_A(x), r_A(x), v_A(x) \leq 3$ 0 conditions for all $x \in X$ $u_A(x), r_A(x)\ y\ v_A(x)$ denote the true, indeterminate, and false membership functions of x in A, respectively. For convenience, a Single Value Neutrosophic Number (SVNN) will be expressed as A = (a, b, c), where a, b, c ∈ [0,1] and satisfies 0 ≤ a + b + c ≤ 3.

The SVNSs arose with the idea of applying the neutrosophic sets for practical purposes. Some operations between SVNN are expressed below:

1. Given A1 = (a1, b1, c1) and A2 = (a2, b2, c2), two SVNN we have that the sum between A1 and A2 is defined as:
$$A_1 \ A_2 = (a_1 + a_2 - a_1a_2, b_1b_2, c_1c_2) \quad (7)$$
2. Given A1 = (a1, b1, c1) and A2 = (a2, b2, c2), two SVNN, the multiplication between A1 and A2 is defined as:
$$A_1 \ A_2 = (a_1a_2, b_1+b_2 - b_1b_2, c_1 + c_2 - c_1c_2) \quad (8)$$
3. The product by a positive scalar with an SVNN, A = (a, b, c) is defined by:
$$A = (1 - (1 - a), b, c) \quad (9)$$
4. Let be a set of n SVNNs, where $\{A_1, A_2, \dots, A_n\}$Aj = (aj, bj, cj) (j = 1, 2, …, n), then the Neutrosophic Single Value Weighted Mean Operator (SVWMO) over the set is calculated by the following Equation:
$$\sum_{j=1}^{n} \lambda_j A_j = \left(1 - \prod_{j=1}^{n} (1 - a_j)^{\lambda_j}, \prod_{j=1}^{n} b_j^{\lambda_j}, \prod_{j=1}^{n} c_j^{\lambda_j}, \right) \quad (10)$$
Where λ_j is the weight of Aj, $\lambda_j \in [0, 1]$ y $\sum_{j=1}^{n} = 1$

Definition 3. Let $A^* = (A_1^*, A_2^*, \dots, A_n^*)$ be a vector of n SVNNs such that $A_j^* = (a_1^*, b_2^*, c_j^*)(j = 1,2, \dots, n)$ and $B_i = (B_{i1}, B_{i2}, \dots, B_{im})(i = 1,2, \dots, m)$ are m vectors of n SVNNs such that (i = 1, 2, …,m)(j = 1, 2, …, n). Then the Separation Measurement between Bi and A* is calculated by the following Equation:
$$s_i = \left(\frac{1}{3} \sum_{j=1}^{n} \left\{ (a_{ij} - a_j^*)^2 + (b_{ij} - b_j^*)^2 + (c_{ij} - c_j^*)^2 \right\} \right)^{\frac{1}{2}} \quad (11)$$
Where i=(1,2,...,m)

Definition 4. Let A = (a, b, c) an SVNN, the score function S of an SVNN, based on true membership degree, undetermined membership degree, and false membership degree is defined by the following Equation :
$$S(A) = \frac{1 + a - 2b - c}{2} \quad (12)$$
Where S(A)[-1, 1]∈

In this article, linguistic terms will be associated with SVNN, so that experts can carry out their evaluations in linguistic terms, which is more natural. Therefore, the scales shown in Tables 1 and 2 will be taken into account.[20].

Linguistic term	SVNN
Extremely good (EG)	(1,0,0)
Very very good (VVG)	(0.9, 0.1, 0.1)
Very good (VG)	(0.8,0,15,0.20)
Good (G)	(0.70,0.25,0.30)
Moderately good (MDG)	(0.60,0.35,0.40)
Medium (M)	(0.50,0.50,0.50)
Moderately bad (MDB)	(0.40,0.65,0.60)
Bad (B)	(0.30,0.75,0.70)
very bad (VB)	(0.20,0.85,0.80)
Very very bad (VVB)	(0.10,0.90,0.90)
Extremely bad (EB)	(0,1,1)

Table 1: Linguistic terms used

Linguistic term	SVNN
Very Important (VI)	(0.95, 0.1, 0.1)
Important (I)	(0.75,0.30,0.45)
Medium (M)	(0.50,0.40,0.60)
Not Important (NI)	(0.30,0.70,0.80)
Not Very Important (NVI)	(0.10,0.75,0.85)

Table 2: Linguistic terms that represent the weight of the importance of the alternatives.

The TOPSIS method for SVNNs consists of the following, assuming that $A = \{\rho_1, \rho_2, \dots, \rho_m\}$ is a set of alternatives and $G = \{\beta_1, \beta_2, \dots, \beta_m\}$ is a set of criteria, the following steps will be carried out:

Step 1: Determine the weight of the experts. For this, the specialists evaluate according to the linguistic scale that appears in Table 1, and the calculations are made with their associated SVNN, let's call $A_t = (a_t, b_t, c_t)$ the SVNN corresponding to the t-th decision-maker (t = 1, 2, …, k). The weight is calculated by the following formula:

$$\lambda_t = \frac{a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)}{\sum_{t=1}^{k} a_t + b_t\left(\frac{a_t}{a_t + c_t}\right)} \quad (13)$$

$$\lambda_t \geq 0 \text{ Y } \sum_{t=1}^{k} \lambda_t$$

Step 2: Construction of the aggregate single value neutrosophic decision matrix. This matrix is defined by $D = \sum_{t=1}^{k} \lambda_t D^t$, where $d_{ij} = (u_{ij}, r_{ij}, v_{ij})$ and is used to aggregate all the individual evaluations. d_{ij} is calculated as the aggregation of the evaluations given by each expert $(u_{ij}^t, r_{ij}^t, v_{ij}^t)$, using the weights of each one with the help of Equation 5. In this way, a matrix D = (dij)ij is obtained, where each dij is a SVNN (i = 1,2,..., m; j = 1,2,..., n).

Step 3: Determination of the Weight of the Criteria. Suppose that the weight of each criterion is given by W = (w1, w2,…, wn), where wj denotes the relative importance of the criterion. Si is the evaluation of the criterion by the t-th expert. Equation 5 is then used to aggregate the w_j^t with the weights λ_t.

Step 4: Construction of the neutrosophic decision matrix of the single-valued weighted mean with respect to the criteria. $D^* = D * W, where\ d_{ij} = (a_{ij}, b_{ij}, c_{ij})$

Step 5: Calculation of the positive and negative SVNN ideal solutions. The criteria can be classified as cost-type or benefit-type.[18]:

$$\rho^+ = a_{\rho+w}(\beta_j), b_{\rho+w}(\beta_j), ac_{\rho+w}(\beta_j) \quad (14)$$

Denotes the positive ideal solution:

$$\rho^- = (a_{\rho-w}(\beta_j), b_{\rho-w}(\beta_j), ac_{\rho-w}(\beta_j)) \quad (15)$$

Denotes the negative ideal solution:

$$a_{\rho+w}(\beta_j) = \begin{cases} max_i a_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ min_i a_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases} \qquad a_{\rho-w}(\beta_j) = \begin{cases} min_i a_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ max_i a_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases}$$

$$b_{\rho+w}(\beta_j) = \begin{cases} max_i b_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ min_i b_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases} \qquad b_{\rho-w}(\beta_j) = \begin{cases} min_i b_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ max_i b_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases}$$

$$c_{\rho+w}(\beta_j) = \begin{cases} max_i c_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ min_i c_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases} \qquad c_{\rho-w}(\beta_j) = \begin{cases} min_i c_{\rho iw}(\beta_j), si\ j \epsilon G_1 \\ max_i c_{\rho iw}(\beta_j), si\ j \epsilon G_2, \end{cases}$$

Step 6: Calculation of the distances to the positive and negative SVNN ideal solutions. With the help of Equation 6, the following Equations are calculated:

$$s_i^+ = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(a_{ij} - a_j^+\right)^2 + \left(b_{ij} - b_j^+\right)^2 + \left(c_{ij} - c_j^+\right)^2\right\}\right)^{\frac{1}{2}} \quad (16)$$

$$s_i^- = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(a_{ij} - a_j^-\right)^2 + \left(b_{ij} - b_j^-\right)^2 + \left(c_{ij} - c_j^-\right)^2\right\}\right)^{\frac{1}{2}} \quad (17)$$

Step 7: Calculation of the Proximity Coefficient (CP). The CP of each alternative is calculated with respect to the positive and negative ideal solutions.

$$\widetilde{\rho_j} = \frac{s^-}{s^+ + s^-} \quad (18)$$

Where $0 \leq .\widetilde{\rho_j} \leq 1$

Step 8: Determination of the order of the alternatives.

They are ordered according to what was achieved by $\widetilde{\rho_j}$. The alternatives are ordered from highest to lowest, under the condition that $\widetilde{\rho_j} \rightarrow 1$ is the optimal solution.

Additionally, for statistical processing, the following formula was used to calculate the sample size.

$$n = \frac{ZNpq}{E^2(N-1) + Z^2pq} \quad (19)$$

Where: n: Sample size, Z: It is the value of the normal distribution with the assigned confidence level, E: Desired sampling error, N: Population size.

4 RESULTS

The study was conducted in the province of Guayas. To carry out the surveys, the area was divided into sectors based on their representativeness in terms of population and commercial activity. Also to demonstrate differential aspects in relation to the number of vendors, land occupation, and square meters occupied by area, as shown:

1. Alborada Sector, Sauces, La Guangala
2. Perimeter Sector: Jacobo Bucaram Cooperative
3. Santiaguito Roldos Sector, Bahía y Malecón
4. Pascuales and PECA Sector
5. Land Terminal Sector, Mercado Las Manuelas Durán

For the calculation of the sample, the infinite sampling formula was used due to the high percentage of people identified in the initial observations, obtaining a total of 384 surveys to be applied as detailed below:

$$n = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} = \frac{0.9604}{0.0025} = 384$$

The population selected through probabilistic sampling was made up of 74% men and 26% women, a situation that highlights greater male participation in the trade. In relation to the marital status variable, the participation of married people or people in a free union, mainly in the male gender, is seen as a trend. Therefore, it could be inferred that these people, being heads of families, feel obliged or need to develop this type of activity to provide food for their homes.

4.1 Information entry

The application of the surveys revealed the following results:

- There is a tendency towards a majority of training in basic education, closely followed by high school training. This indicates that most of the subjects opt for this activity because they are not competitive in the state labor market.
- Vendors of Venezuelan nationality constitute the group with a higher percentage of third-level training, while the Colombian population that develops informal activities in zone 8 is mostly at a basic training level.
- In relation to job satisfaction, the response was unanimous, showing 89% acceptance of the activity currently carried out by both men and women, regardless of their nationality. Among the factors that they indicated as favorable is the management of their time.
- Street vendors, although they violate municipal regulations in relation to the occupation of public roads, are aware of the importance of complying with regulations, in order not to incur in violations and not be subject to persecution in their daily work.
- When surveyed about the reason why they are located in certain areas, the majority percentage fell on the pedestrian traffic factor. This refers to open areas such as squares, parks, and exteriors of centers with a high concentration of people such as public offices, hospitals, universities, among others.
- It was interesting that the presence of competitors does not represent a relevant factor when selecting the place, this was evidenced during the non-participant observations where different vendors with similar offers could be made visible, especially in the food and beverage category.
- The vendors were also surveyed in relation to various factors that they consider important to improve their current situation, the trend reflects the desire of those involved in street vending to have some type of government help, not necessarily in monetary terms, but rather they seek facilities to carry out their activities safely and without being persecuted.
- Other vendors also mentioned the need to have access to working capital through microcredits offered by the government, which they cannot access because they do not have a formal and regulated job.

From the study it was possible to conclude that there are variables of interest that define the possible courses of action, which are summarized below:

1. Government financial aid
2. Immigration incidence
3. Location and presence of competitors
4. Need for regulations that guarantee their safety
5. Studies and training

4.2 Neutrosophic analysis

We proceed to apply the NCM to determine their level of influence and interrelation. Figure 2 shows the results:

	0	I	0.5	0.8+I	1
	0	0	0.4	0.2	1
N(E)=	1	0	0	0	1
	0.3	1	0.9	0.9	1
	1	I	1	0.5	1

Table 3: Neutrosophic Adjacency Matrix.

	1	2	3	4	5	out-degree	Indegre	Total Degree
1	0	0.12195	0.12195	0.15853	0.24390	0.64634146	0.56097561	**1.20731707**
2	0	0	0.09756	0.04878	0.24390	0.3902439	0.48780488	**0.87804878**
3	0.24390243	0	0	0	0.24390	0.48780488	0.68292683	**1.17073171**
4	0.07317073	0.24390	0.21951	0.21951	0.24390	1	0.54878049	**1.54878049**
5	0.24390243	0.12195	0.24390	0.12195	0.24390	0.97560976	1.2195122	**2.19512195**

Table 4. De-neutrosophication of the Matrix and Values Outdegree, indegree, total degree by factors

As can be verified, the variables have strong interrelationships, and they are all ordinary. Therefore, they have a high level of influence among them and tend to be evaluated in an integrated manner. Therefore, TOPSIS is an appropriate tool.

- The incidence of immigration does not favor formal employment since it increases competition, as evidenced in the causal relationship with the positive indices.
- Education and training and the need for financial assistance from the government manifest equal levels of influence and need for attention.
- The presence of competitors with similar locations and the need for regulations that guarantee their safety has a high level of interrelation with the variables in general since it becomes a consequence of the actions of the rest.

Then it was decided to apply the TOPSIS analysis to assess the need for implementation for each area studied and thus differentiate the measures to be taken in each of these areas. The particularization of the course of action is a necessary strategy as a corrective measure to eliminate the causes of the social problems generated by street vendors with formal businesses. The results are displayed as follows:

- 4 Groups: according to the types of street vending (the types of products offered, the geographical location where they offer their products, the infrastructure used for the sale, and the level or degree of informality in which they work).
- 5 Alternatives: the sectors studied
- 5 Criteria: the variables of interest

Variables of interest	Types of products offered	The geographical location	Infrastructure used	Level or degree of informality
importance vector	(0.50;0.5;0.50)	(0.10;0.90;0.90)	(0.35;0.75;0.80)	(0.75;0.25;0.20)
$\boldsymbol{\lambda_t}$	0.202171285	0.13536686	0.183867286	0.23493422

Table 5: Calculation of the importance vector (λ_t)

Sectors	Types of products offered	The geographical location	Infrastructure used	Level or degree of informality
Alborada Sector, Sauces, La Guangala	(0.25;0.6;0.8)	(0.95;0.1;0.1)	(0.25;0.6;0.8)	(0.1;0.75;0.85)
Perimeter Sector: Jacobo Bucaram Cooperative	(0.95;0.1;0.1)	(0.75;0.3;0.4)	(0.95;0.1;0.1)	(0.95;0.1;0.1)

Santiaguito Roldos Sector, Bahía y Malecón	(0.1;0.75;0.85)	(0.1;0.75;0.85)	(0.1;0.75;0.85)	(0.25;0.6;0.8)
Pascuales and PECA Sector	(0.25;0.6;0.8)	(0.25;0.6;0.8)	(0.25;0.6;0.8)	(0.1;0.75;0.85)
Land Terminal Sector, Mercado Las Manuelas Durán	(0.25;0.6;0.8)	(0.25;0.6;0.8)	(0.75;0.3;0.4)	(0.75;0.3;0.4)

Table 6: Single Values Criteria Matrix

Sectors	government financial aid	Immigration incidence	Location and presence of competitors	Need for regulations that guarantee their safety	Studies and training
Alborada Sector, Sauces, La Guangala	(0.60505;0.42295; 0.3883)	(0.87598;0.12402; 0.11769)	(0.39141;0.64868; 0.66762)	(0.731;0.2816; 0.2875)	(0.5393;0.5178; 0.5458)
Perimeter Sector: Jacobo Bucaram Cooperative	(0.82482;0.17518; 0.16814)	(0.54478;0.45522; 0.44167)	(0.85848;0.14152; 0.13005)	(0.7487;0.2513; 0.2513)	(0.7022;0.2978; 0.2846)
Santiaguito Roldos Sector, Bahía y Malecón	(0.66087;0.36317; 0.37456)	(0.46733;0.56165; 0.57524)	(0.21933;0.83106; 0.85484)	(0.1888;0.8491; 0.8668)	(0.263;0.8047; 0.8372)
Pascuales and PECA Sector	(0.64239;0.3942; 0.4119)	(0.3256;0.69419; 0.70331)	(0.6916;0.46192; 0.33344)	(0.5627;0.8108; 0.7291)	(0.3346;0.7212; 0.7479)
Land Terminal Sector, Mercado Las Manuelas Durán	(0.77277;0.23785; 0.22996)	(0.83384;0.16616; 0.14683)	(0.83103;0.16897; 0.14871)	(0.866;0.134; 0.1248)	(0.8245;0.1755; 0.153)

Table 7: Experts' Aggregated decision table

Criteria	Weights
government financial aid	(0.81192;0.18808;0.16126)
Immigration incidence	(0.70412;0.29588;0.2499)
Location and presence of competitors	(0.67785;0.33356;0.31614)
Need for regulations that guarantee their safety	(0.75;0.25;0.20)
Studies and training	(0.9;0.1;0.1)

Table 8: Weights assigned by the experts to each criterion

Sectors	government financial aid	Immigration incidence	Location and presence of competitors	Need for regulations that guarantee their safety	Studies and training
Alborada Sector, Sauces, La Guangala	(0.5388;0.47362; 0.41929)	(0.61052;0.38948; 0.34293)	(0.27397;0.74612; 0.74685)	(0.58478;0.42558; 0.3924)	(0.52884;0.51355; 0.53434)
Perimeter Sector: Jacobo Bucaram Cooperative	(0.71047;0.28953; 0.26052)	(0.39314;0.60686; 0.56822)	(0.59799;0.41208; 0.39356)	(0.49643;0.50358; 0.47048)	(0.6732;0.3268; 0.31366)
Santiaguito Roldos Sector, Bahía y Malecón	(0.58863;0.42152; 0.40729)	(0.38737;0.63562; 0.62344)	(0.17238;0.87337; 0.89112)	(0.16163;0.87498; 0.88512)	(0.20934;0.84079; 0.86464)
Pascuales and PECA Sector	(0.57241;0.44824; 0.44022)	(0.18121;0.83918; 0.83874)	(0.49894;0.63364; 0.51626)	(0.22238;0.838; 0.85856)	(0.29664;0.74098 ;0.75862)
Land Terminal Sector, Mercado Las Manuelas Durán	(0.63301;0.37813; 0.363)	(0.56633;0.43367; 0.37454)	(0.54223;0.4669; 0.43171)	(0.6396;0.3604; 0.3072)	(0.75906;0.24094; 0.22636)

Table 9: Experts' Aggregated decision table

Sectors	ideal value +	ideal value -	d+	d-	Zip	Order
Alborada Sector, Sauces, La Guangala	(0.71047;0.28953;0.26052)	(0.5388;0.47362;0.41929)	0.59298242	0.6581248	0.526034	3
Perimeter Sector: Jacobo Bucaram Cooperative	(0.61052;0.38948;0.34293)	(0.18121;0.83918;0.83874)	0.404181173	0.6756475	0.625699	2
Santiaguito Roldos Sector, Bahía y Malecón	(0.59799;0.41208;0.39356)	(0.17238;0.87337;0.89112)	1.030699669	0.2902136	0.219707	5
Pascuales and PECA Sector	(0.6396;0.3604;0.3072)	(0.16163;0.87498;0.88512)	0.941680557	0.3372478	0.263696	4
Land Terminal Sector, Mercado Las Manuelas Durán	(0.75906;0.24094;0.22636)	(0.20934;0.84079;0.86464)	0.265799329	0.8226934	0.75581	1

Table 10: Positive and negative ideal values by criterion and the distances to the negative and positive solutions

5 Solutions

For this reason, public policies could be considered to combine effort towards a comprehensive education of citizens to open up greater opportunities for full employment and training from a technical-professional point of view. Prioritizing the need to associate or be part of a foundation since they are also considered important but not with the same significance as government aid. For the start of the intervention, the sector with the best level is the Terrestrial Terminal and Las Manuelas Durán Market. Therefore, it is not recommended to start with this because it presents a favorable situation. Not so in the case of the Santiaguito Roldos, Bahía, and Malecón sectors, which present the most critical situation, followed by Pascuales and PECA.

Conclusion

Throughout this analysis, it was possible to identify the need for street vendors to improve their current situation in economic and social terms, given that they indicated that they do not have the support of either the private company or the control agencies and this affects their performance in their daily tasks. The analysis of the educational level factor shows that only a minority of the participants have third-level education, which allows us to infer that the higher the level of training, the greater the employment or formal opportunities. Therefore, it can be recommended to promote public policies towards the strengthening of education. It was analyzed that if they had support from a private entity or a foundation they could improve their current situation by contributing to their social, emotional, and work development.

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