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Selection of Experts to Validate a Research Proposal Using a Neutrosophic Method

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Abstract. The regulation and relocation of tolerance centers has remained a current and important issue in Ecuador. As a proposal to solve this situation, we elaborated a Project of Municipal Ordinance to relocate the tolerance centers. We propose the use of expert criteria to validate the application of the proposed project in the city of Tulcan, Ecuador. For the selection of the experts, we made use of the neutrosophic theory, with single value neutrosophic sets (SVNS) associated to linguistic variables. The use of SVNS allowed us to evaluate the level of theoretical and practical knowledge of the experts in the subject under study, and their suitability to analyze it, taking into account the weight that the experts assigned themselves. As a main result, the proposed project was validated, obtaining a "Very relevant" general evaluation.

Keywords: Experts method; knowledge level; neutrosophic theory; tolerance centers.

1 Introduction

The regulation and relocation of tolerance centers has remained a current and important issue in Ecuador, due to the lack of attention from different government entities, which has caused the inappropriate use of these spaces to proliferate, affecting the increase in crime and the welfare of other inhabitants of the town. This has been an issue of interest to both the civilian population and local governments, who are the ones who must provide solutions to the community[1].

Centers of tolerance exist in many countries of the world, but they must comply with the regulations established for this type of place. They allow the legal prostitution of adults, and the people who engage in this activity are subject to a commitment with the health department, which obliges them to undergo permanent medical examinations to ensure that they are not infected by HIV and other sexually transmitted infection. In addition, they are given free condoms, to avoid as much as possible these places to be sources of infection and contagion [2].

Since the centers of tolerance are places where alcohol is sold, and narcotic substances are consumed, these places often trigger physical, psychological and sexual violence in the city of Tulcan, province of Carchi. Tolerance centers must be immediately relocated in order to solve this social problem. It is indispensable to design an ordinance with the corresponding regulations in order to protect the safety and the best interest of the children who live in the houses next to these tolerance centers. Such centers cause fear and insecurity to all their neighbors, violating their rights guaranteed in The Good Living by the Decentralized Autonomous Government of the Municipality of Tulcan[3].

This way, the principle of the best interest of the child is being violated, which goes against the guarantee of Good Living for this vulnerable social group, due to the lack of design and approval of an ordinance that regulates the relocation of the tolerance centers in the canton of Tulcán[4, 5].

For this reason, the author has elaborated a Project of Municipal Ordinance to relocate the tolerance centers, which is reproduced below:

DRAFT ORDINANCE FOR THE RELOCATION OF TOLERANCE CENTERS IN THE CANTON OF TULCÁN, PROVINCE OF CARCHI

Article 1. Object. The present ordinance has as object, to establish the norms and the legal minimum requirements, that will govern for the regulation, control and sanction, to guarantee its fulfillment, in the implantation of fixed structures, for the operation of the sites of diversion and tolerance, within which it includes the activity of the sexual commerce, which will be relocated in the canton Tulcan, territory and jurisdiction of the Decentralized Autonomous Municipal Government of Tulcan, considered as Zone of Urban Expansion, in the Plan of Development and Territorial Ordering.

Article 2. Scope. This ordinance will act in accordance with other laws and regulations issued for purposes related to it, guaranteeing citizens and the rights of children and adolescents and other urban centers for an orderly and sustained development, the provisions of this ordinance, would apply throughout the territory of Canton Tulcan.

Article 3. Subjects. Natural or legal persons, national or foreign, public or private, in general of the establishments that have their respective permits, shall be subject to these provisions.

Article 4. General Conditions for the Implantation and Relocation of the Centers of Tolerance. Of the premises for the work of sexual activity and related to the canton of Tulcan, necessarily must comply with the conditions of zoning, use and occupation of land and space of green areas, evacuation of rainwater and sewage and so on; in relations of compatibility with the ordinance that regulates the Use and Occupation of land, as equipment for public services, as a line of transport, water, electricity, telephone, electric lighting service, internet etc., taking into account as a category, infrastructure, sectorial type and regulations related to the work to be developed, as well as comply with the general conditions required.

Article 5. Prohibitions of Tolerance Centers. All tolerance centers that develop their sexual activity, due to human development or expansion, will be prohibited. They will be relocated to less than 200 to 300 meters from the cantonal urban zone, with the prohibition of regulating their work activity, close to: gardens, schools, colleges, sports or activity parks where children and adolescents are found, who will be totally prevented from working in establishments near these places, by the Decentralized Autonomous Municipal Government of the Canton of Tulcan, after a technical report of inspection of urban expansion in which the radius of 200 to 300 meters around the urban zone is respected.

Article 6. Particular Conditions for the Relocation of the Tolerance Centers. The premises or establishments dedicated to sexual activity, which at the date of approval of this Ordinance and are operating in the urban areas and urban expansion of Canton Tulcan, which do not affect with a visual impact to the transient community, even if they are in closed sites with isolation of 100 to 200, meters of populated areas will continue to operate in the site where they are located, and provided that its location is safe and has not been implemented on slopes or sites of high risk.

The time that all these premises located as tolerance centers have for their relocation as of one year from the date of approval of this Ordinance, except for some complication of natural order or force majeure for which an extension of three months is granted; for such effect the municipal administration will lend the facilities that were the case in function of the fulfillment of this disposition.

It must be taken into account that no permit will be allowed or extended for the operation of those premises dedicated to sexual activity, which after the approval of this provision continue working within the urban and peripheral perimeter, which will be closed permanently by the municipal administration of the canton of Tulcan.

Article 7. Conditions of Visual, Landscape, Hygienic and Sound Impact Taking into consideration the following conditions:

a) For the improvement of the ornament of the canton and the operation of the complex center of tolerance they will have to maintain the entire complex clean and hygienic, keeping a minimum impact in case of producing some sinister.
b) At the same time, the tolerance centers and each one of the different premises or establishments that operate in the complex are protected by this ordinance with their portals or porches in addition to the surroundings must be suitable in accordance with this municipal ordinance.
c) In case of emergency, there will be no obstacle to their evacuation. The garbage or waste generated by the premises and complex itself will be collected in waste deposits with classification.
d) The sound generated by the tolerance centers in general within the complex, shall not exceed decibels of noisy or strident impact that contaminates the surrounding environment and affects the health of those who come to these sites, noise, vibrations and disproportionate sounds are prohibited.
e) If there is any infringement of criminal law, regardless of whether it is recorded inside or outside the premises, the owner of the site who feels affected shall file the corresponding complaint with the competent authorities for the case.
f) In those establishments where the sex trade and the sale of alcoholic beverages are carried out, infrared cameras are used to capture and record any incident that may occur in the establishment.

Article 8. Operation. The operation permits will have the validity determined by the Municipal Administration of the Decentralized Autonomous Government, taking into consideration what is established by article 4 of the present ordinance.

Article 9. Jurisdiction and Competence. The Mayor of the Decentralized Autonomous Government of the Canton of Tulcan, and the other authorities within its jurisdiction in accordance with the control exercised, have jurisdiction and competence to know, sanction and resolve the violations of this ordinance.

Article 10. Sanctions. In the event of failure to comply with this Ordinance by the owners within the period assigned in accordance with Article 5 of this Ordinance, in an unjustified manner, the local authorities shall proceed to relocate the premises and establishments of the sex trade and the sale of alcoholic beverages, in a coercive manner to the site to be assigned after informing the intendant of the Decentralized Autonomous Government of the Canton of Tulcán.

Article 11. Validity. The present ordinance will become effective as of its approval without prejudice of its promulgation in the Official Registry.

Hence, the objective of this investigation is to validate the project of municipal ordinance to regulate the relocation of the centers of tolerance in the city of Tulcan by means of the experts' criterion.

Previous investigations

At a Latin American level, the work carried out in Colombia at Universidad del Valle, under the title "Female sex work, a comparative analysis of two night clubs in the city of Cali", has been found to have a background, establishing the need to change the centers of tolerance and relocate them outside the urban center, due to the insecurity they generate [6].

At the national level, there is the undergraduate work of [2] "Sex work and labor rights" where he analyzes the legal problems involved in sex work in centers of tolerance.

On the other hand, [7] in his work "The Municipal Public Policy against Street Sex Work and the use of Public Space in Urban Regenerated Areas, case La 24 de Mayo" deals with the life of the sex workers and the mechanisms of regulation of the use of public space.

2 Methods

We used neutrosophic theory to make the selection of the experts, based on their self-evaluation of their level of theoretical and practical knowledge in the subject, as well as evaluation of the weight of theoretical knowledge in relation to practical knowledge.

Neutrosophy, which was proposed by Smarandache[4, 8, 9] for the treatment of neutralities, has formed the basis for a series of mathematical theories that generalize classical and diffuse theories such as neutrosophic sets and neutrosophic logic [10, 11].

The original definition of truth value in the neutrosophic logic is shown below:

Set N = {(T, I, F): T, I, F ⊆ [0, 1]} n, a neutrosophic valuation is a mapping of a group of propositional formulas to N, and for each p statement you have:

$$v(p) = (T, I, F) \quad (1)$$

Neutrosophic set theory starts from classical set theory and fuzzy set theory, adding a membership function to the set μ generally defined as an x-number between 0 and 1 (the interval [0.1], instead of the classical binary membership defined in the set {0.1}. Thus, we introduce the concept of a neutrosophic set associated to a certain linguistic value, defined by a word, adjective or linguistic label A, [12, 13].

A neutrosophic set A is defined as a membership function that links the elements of a domain or universe of discourse X with elements of the interval [0,1]: A: X→[0,1]. For each neutrosophic set a belonging or inclusion function μA(x) is defined, which represents the degree to which a value for the variable x is included in the concept represented by the label A. The closer A(x) is to the value 1, the greater the membership of the object x to the set A. The values of membership vary between 0 (no belonging at all) and 1 (total belonging) so that a neutrosophic set is a class of objects with continuous degrees of membership [14].

The use of single-value neutral sets (SVNS) allows the use of linguistic variables, which increases the possibility of interpretation in recommendation models and the use of indetermination [15-17].

Let X be a universe of discourse, a SVNS A over X has the following form:

$$A = \{\langle x, u_a(x), r_a(x), v_a(x)\rangle : x \in X\}d \quad (2)$$

Where

$$u_a(x): X \to [0,1], r_a(x): X \to [0,1] \; y \; v_a(x): X \to [0,1]$$

With

$$0 \leq u_a(x), r_a(x), v_a(x) \leq 3, \qquad \forall\, x \in X$$

The intervals $u_a(x), r_a(x)$ and $v_a(x)$ denote the memberships to true, indeterminate and false of x in A, respectively.

The first step for the selection of the experts was a pre-selection of 30 lawyers from the Municipality of Tulcán, Province of Carchi. The pre-selection was based on the years of experience in the profession (more than five years) and the willingness to participate in the study.

These attorneys were explained the problems previously analyzed and were asked to qualitatively evaluate their level of theoretical and practical knowledge (understood as that acquired through the practical exercise of their profession) in the subject analyzed, according to the categories suggested in Figure 1)[18-20]

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Evaluate your level of knowledge in the topic to be addressed according to the following categories *Extremely high (EH), Very very high (VVH), Very high (VH), High (H), Medium high (MH), Medium (M), Medium low (ML), Low (L), Very low (VL), Very very low(VVL) y Extremely low (EL)*	
Level of theoretical knowledge	
Level of practical knowledge (knowledge acquired through the practical exercise of your profession)	
Evaluate on a scale of 1 to 100 the weight you give to theoretical knowledge in relation to practical knowledge, for the analysis of the subject in question	
Weight of theoretical knowledge	

Figure 1. Questionnaire applied for the evaluation of the knowledge levels of experts and the weight of theoretical knowledge. Source: Authors' elaboration

They were also asked to evaluate what weight they would grant, on a scale of 1 to 100, to the theoretical knowledge in relation to practical knowledge, for the analysis of the subject in question.

This value was divided by 100 and the difference was found to be 1, to know the value given to practical knowledge. In other words, the sum of the two weights is equal to 1. Thus, the averages of the weights given were established as *wt* (weight of the theoretical knowledge level) and *wp* (weight of the practical knowledge level).

For the processing of these self-evaluations, we propose the association of the linguistic terms to the SVN numbers shown in table 1.

LINGUISTIC TERM	**EVALUATION**	**SVN NUMBERS**
Extremely High	EH	(1; 0; 0)
Very Very High	VVH	(0.9, 0.1, 0.1)
Very High	VH	(0,8; 0,15; 0,20)
High	H	(0.70,0.25,0.30)
Medium High	MH	(0,60; 0,35; 0,40)
Medium	M	(0,50; 0,50; 0,50)
Medium Low	ML	(0,40; 0,65; 0,60)
Low	L	(0.30,0.75,0.70)
Very Low	VL	(0,20; 0,85; 0,80)
Very Very Low	VVL	(0.10,0.90,0.90)
Extremely Low	EL	(0; 1; 1)

Table 1. Linguistic terms used. Source: Authors' elaboration

To aggregate the assessments of theoretical and practical knowledge given by the experts in order to determine their level of total knowledge in the subject, the single-value weighted average (SVNWA) was used, which is defined as[21]:

$$F_w(A_1, A_2, \dots, A_n) = \langle 1 - \prod_{j=1}^{n} \left(1 - T_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n} \left(I_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n} \left(F_{A_j}(w)\right)^{w_j} \rangle \qquad (3)$$

Where:

$W = (w_1, w_2, \dots, w_n)$ is vector of $A_j (j = 1,2, \dots, n)$ such that $w_n \in [0,1]$ y $\sum w_j = 1$.

Once the aggregations were obtained, the score function was used to obtain a unique value for the expert evaluation [22]:

$$s(V_j) = 2 + T_j - F_j - I_j \quad (4)$$

With this value, a qualitative evaluation of each expert was obtained by taking the possible score (from 0 to 3) and was divided by 11 (according to the number of language terms used, thus obtaining the intervals to classify the scores, as shown in Table 2.

LINGUISTIC TERM	EVALUATION	SCORING INTERVALS
Extremely Low	EL	[0 - 0,270)
Very Very Low	VVL	[0,27 - 0,55)
Very Low	VL	[0,55 - 0,81)
Low	L	[0,81 - 1,09)
Medium Low	ML	[1,09 - 1,36)
Medium	M	[1,36 - 1,63)
Medium High	MH	[1,63 – 1,90)
High	H	[1,90 – 2,18)
Very High	VH	[2,18 – 2,45)
Very Very High	VVH	[2,45 – 2,72)
Extremely High	EH	[2,72 – 3]

Table 2. Intervals for evaluation of the expert's level of knowledge according to score function value Source: Authors' elaboration

With this evaluation, the experts were selected according to the chosen criteria. In this case, the experts with "Very very high" and "Very high" level of knowledge.

These selected experts were surveyed to validate the Municipal Ordinance Project previously presented, with the format shown in figure 2.

Mark with an X the rating given to the Draft Municipal Ordinance presented for the relocation of the Tolerance Centers in the Canton of Tulcan, according to the following categories

Very Relevant (VR), Quite Relevant (QR), Relevant (R), Not very Relevant (NVR) and Not Relevant (NR)

	Criteria to be evaluated	VR	QR	R	NVR	NR
1	It has consistency in its writing					
2	It has a commitment to legality					
3	It corresponds to the constitutional principles of Ecuador					
4	Attributes a greater responsibility in the location and control of these tolerance centers, to the competent authorities of the Decentralized Autonomous Municipal Government of Tulcan					
5	It allows to guarantee the Good Living to the inhabitants of Tulcan					
6	Protect the rights of children and adolescents of Tulcan					
7	It is appropriate given the problems presented					
8	It has feasibility for practical application					

Figure 2. Questionnaire applied to experts for the validation of the Draft Municipal Ordinance. Source: Author's elaboration

Once the survey was applied, the cut-off points and their respective indicator scales were calculated using the inverse standard normal values. This was done by approximating the closest value of the cumulative probability Standard Normal curve.

Finally, the N-P value was estimated, obtained as the difference of the limit value minus the average value of each statement, and the relevance of each statement was determined through the comparison of the N-P value of each statement with the cut-off points and range limits of each of the categories.

3 Results

The results of the evaluations of the experts' level of theoretical and practical knowledge are shown in table 3.

EXPERT	LEVEL OF THEORETICAL KNOWLEDGE	LEVEL OF PRACTICAL KNOWLEDGE
1	MH	MH
2	VVH	MH
3	M	MH
4	ML	L
5	H	VVH
6	VL	L
7	H	H
8	MH	MH
9	ML	ML
10	MH	ML
11	MH	ML
12	ML	M
13	VH	H
14	MH	M
15	MH	MH
16	H	VH
17	MH	ML
18	VH	VVH
19	L	VL
20	H	MH
21	MH	H
22	MH	M
23	L	VL
24	H	VVH
25	H	H
26	H	VH
27	ML	H
28	MH	VH
29	MH	H
30	M	MH

Table 3. Self-evaluation of experts on their level of theoretical and practical knowledge on the subject. Source: Authors' elaboration

Then, the weights of the levels of theoretical and practical knowledge (w_t y w_p) for the analysis of the topic were determined, according to the average of the values given by the experts. The result was that $w_t=0,3$ y $w_p=0,7$. As we can see, the experts considered that for the analysis of the topic in question, the experience obtained through the exercise of the profession has a greater weight.

With these results, the aggregation of the evaluations in both fields was done using the SVNWA operator (table 4).

EXPERT	AGGREGATION
1	(0,6 ; 0,35 ; 0,35)
2	(0,74 ; 0,24 ; 0,24)
3	(0,57 ; 0,39 ; 0,39)
4	(0,33 ; 0,72 ; 0,72)
5	(0,86 ; 0,13 ; 0,13)
6	(0,27 ; 0,78 ; 0,78)

7	(0,7 ; 0,25 ; 0,25)
8	(0,6 ; 0,35 ; 0,35)
9	(0,4 ; 0,65 ; 0,65)
10	(0,47 ; 0,54 ; 0,54)
11	(0,47 ; 0,54 ; 0,54)
12	(0,47 ; 0,54 ; 0,54)
13	(0,73 ; 0,21 ; 0,21)
14	(0,53 ; 0,45 ; 0,45)
15	(0,6 ; 0,35 ; 0,35)
16	(0,77 ; 0,17 ; 0,17)
17	(0,47 ; 0,54 ; 0,54)
18	(0,88 ; 0,11 ; 0,11)
19	(0,23 ; 0,82 ; 0,82)
20	(0,63 ; 0,32 ; 0,32)
21	(0,67 ; 0,28 ; 0,28)
22	(0,53 ; 0,45 ; 0,45)
23	(0,23 ; 0,82 ; 0,82)
24	(0,86 ; 0,13 ; 0,13)
25	(0,7 ; 0,25 ; 0,25)
26	(0,77 ; 0,17 ; 0,17)
27	(0,63 ; 0,33 ; 0,33)
28	(0,75 ; 0,19 ; 0,19)
29	(0,67 ; 0,28 ; 0,28)
30	(0,57 ; 0,39 ; 0,39)

Table 4. Aggregation results Source: Author's elaboration

From the aggregations, the score per expert was obtained and his qualitative evaluation for the analysis of the topic, taking into account the intervals of score by categories of evaluation determined previously, as shown in table 5.

expert	level of knowledge on the subject	
	Score	***Evaluation***
1	1,85	MH
2	2,231844896	VH
3	1,755084364	MH
4	0,944785412	L
5	2,590283946	VVH
6	0,764081225	VL
7	2,15	H
8	1,85	MH
9	1,15	ML
10	1,397605594	M
11	1,397605594	M
12	1,402835157	M
13	2,254240204	VH

14	1,615489831	M
15	1,85	MH
16	2,373419178	VH
17	1,397605594	M
18	2,640836424	VVH
19	0,64415305	VL
20	1,94975318	H
21	2,069363957	H
22	1,615489831	M
23	0,64415305	VL
24	2,590283946	VVH
25	2,15	H
26	2,373419178	VH
27	1,928322722	H
28	2,314129843	VH
29	2,069363957	H
30	1,755084364	MH

Table 5. Qualitative evaluations of the level of knowledge of the experts in the subject according to score. Source: Author's elaboration

Finally, the experts with "Very Very High" and "Very High" level of knowledge were selected, for a total of eight experts.

The results of the application of the survey to these eight experts were as follows (figure 3):

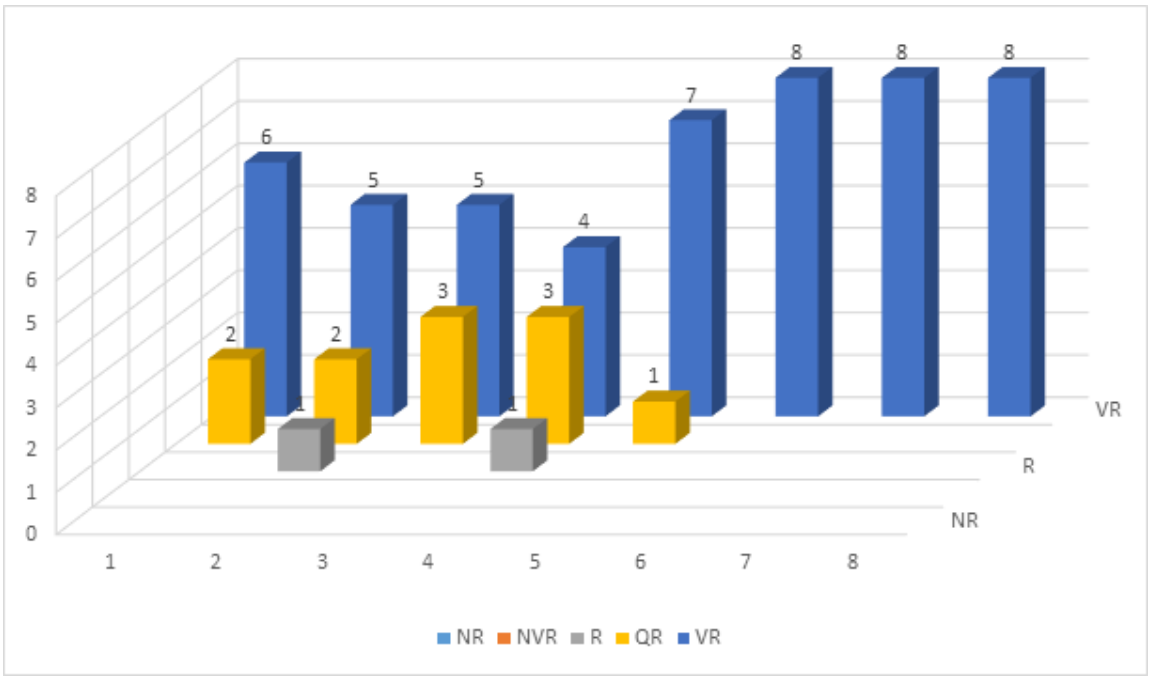

Figure 3. Results of expert survey application (absolute frequency). Source: Authors' elaboration

The majority score for each category to be evaluated was "Very relevant", being this total in questions 6, 7 and 8, while in questions 1 to 5 some scores were also obtained as "Relevant" and "Quite relevant", but in a smaller proportion.

When analyzing the image of the relative frequencies, the respective cut-off points and the N-P values (table 6), of each analyzed category, we found that all are in the range of "Very Relevant".

CRITERIA	Image of the relative cumulative frequencies						
	NR	NVR	R	QR	VR	Average	N-P
1	-3,500	-3,500	-3,500	-0,674	3,500	-1,535	-0,072
2	-3,500	-3,500	-1,150	-0,319	3,500	-0,994	-0,613
3	-3,500	-3,500	-3,500	-0,319	3,500	-1,464	-0,143
4	-3,500	-3,500	-1,150	0,000	3,500	-0,930	-0,677
5	-3,500	-3,500	-3,500	-1,150	3,500	-1,630	0,023
6	-3,500	-3,500	-3,500	-3,500	3,500	-2,100	0,493
7	-3,500	-3,500	-3,500	-3,500	3,500	-2,100	0,493
8	-3,500	-3,500	-3,500	-3,500	3,500	-2,100	0,493
Cut-off Points	-3,500	-3,500	-2,913	-1,620	3,500	-1,607	

Table 6. Images by the Standard Inverse Normal Curve, Cut-off Points, and N-P values Source: Author's elaboration

We then can conclude that the evaluations provided by the members of the panel of experts validate the proposal of the Municipal Ordinance Project of the Centers of Tolerance of the canton of Tulcan.

Conclusions

In this paper the use of expert criteria to validate the application of the proposed project in the city of Tulcan, Ecuador is presented. For the selection of the experts, we made use of single value neutrosophic sets (SVNS) associated to linguistic variables. The use of Neutrosophy for the selection of experts, allowed a more accurate evaluation of them in terms of the level of knowledge in the topic addressed, by making a detailed qualitative self-assessment of their levels of theoretical and practical knowledge and taking into account the weight they gave to these two levels.

The Project of Municipal Ordinance of the Centers of Tolerance of the canton of Tulcan presented was validated with a qualification of "Very relevant" in all the evaluated criteria.

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