Fuzzy Multi Criteria Decision For Industriel Zone Selection

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Abstract

Fuzzy Multi Criteria Decision is process of Selection and range, However they have different way to use it in Decisional Problem, our situation is to Select the best Zone Between the others looking the Criteria of Temperature, Socio Economic, Acclimatization, Population, to select the adequate Alternative by using The AHP Method proposed by Saaty [3], also, we have added the FAHP (Fuzzy AHP) Method, it's for more precision and exactly result.

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Abstract: Fuzzy Multi Criteria Decision is process of Selection and range, However they have different way to use it in Decisional Problem, our situation is to Select the best Zone Between the others looking the Criteria of Temperature, Socio Economic, Acclimatization, Population, to select the adequate Alternative by using The AHP Method proposed by Saaty [3], also, we have added the FAHP (Fuzzy AHP) Method, it's for more precision and exactly result.
Keyword: Fuzzy Logic, AHP, Fuzzy Multi Criteria Decision.

I. INTRODUCTION

Multi Criteria Decision is one of rich domain developed for the decider, Environment Criteria , Climate, Socio Economic Criteria, and Temperature are the selected factors for the installation site in Algeria, AHP (Analytical Hierarchy Process) is the crucial tools for the Analytical Process and the Ranking of this Alternatives with Saaty Echelle [3] , also this problem is with height complexity of four Criteria and five Alternative.

Fuzzy Multi Criteria Decision is appliqued on the same problems with choosing of Representation Model between tow way, Rectangular Membership Model [3] or Trapezoidal Membership Model.

This Paper is object to provide the final resolve of Alternative ranking with tow Method, the AHP Solution, it's based on The Select Weight of each Criteria and Alternative [3], then, the FAHP [5] Second solution to take the best decision with The selection of each Fuzzy Criteria and Fuzzy Alternative.

The combine Between Fuzzy Logic and AHP is to studies more precision of the choice of site and Found the Site Ranking.

The remainder of this article is presented as Follow: Section 2 is focused to the Related Work who can be devised on Theory Research and applied Research, also, The section 3 explain the proposal approach and Our Fuzzy Decision Support System (FDSS), The Conception is represented in section 4 , we concluded by Conclusion and Perspectives.

II. RELATED WORK

Working on Multi Criteria Decision may be have certain number of thing :

1. State of art and Theory

The work in AHP and FAHP Context is remounted on 2008 with M.H. Vahidnia, A. Alesheikh, A. Alimohammadi, and A. Bassiri [2], they have included the Spatial Criteria of Hydrology and water resources, Forestry, Transportation, Agriculture, Natural hazard management, Health care resource allocation and T.Aissa, A. Baghdad in 2017, have Introduce four Spatial Criteria (Economic Criteria, Temperature, Climate and Environment Criteria) , and about the Alternative they have use local Actions.

2. Development state

The work of 2008 has concentered on the FAHP implementation based on theory AHP, never model have used in this time (2008) but in [6], They have worked with the Triangular Function , The MCDA method have resulted more than one result and they have displayed three result for each one Local Alternatives .

About the mixed integration between the AHP and GIS , they have visualized the spatial Alternative and the Spatial Criteria in two way , in the input and output there are displaying of Site Alternatives

III. BACKGROUND

1. MCDM and GIS

GIS and MCDM are currently the two most common decision support tools employed to solve spatial decision-making problems. GIS is a computer-based technology and methodology for collecting, managing, analyzing, modeling, and presenting geographic data for a wide range of applications [3]. MCDM techniques are decision support tools designed to analyze decision problems, generate useful alternative solutions, and evaluate alternatives based on the decision maker's values and preferences. The general objective of these methods is to assist the decision maker in selecting the best alternative from the number of feasible alternatives under the presence of multiple choice criteria and diverse criteria priorities [8, 15]. A literature review suggests that a number of approaches have been used in formulating MCDM tools.
In this Research, we have used AHP like subjective Method who can set decision in the restricted environments, with the GIS , it was one of the procedure MCDM

2. AHP

Analytic Hierarchy Process (AHP) is one of Multi Criteria decision making method that was originally developed by Prof. Thomas L. Saaty. In short, it is a method to derive ratio scales from paired comparisons. The input can be obtained from actual measurement such as price, weight etc., or from subjective opinion such as satisfaction feelings and preference. AHP allow some small inconsistency in judgment because human is not always consistent. The ratio scales are derived from the principal Eigen vectors and the consistency index is derived from the principal Eigen value.

Pairwise comparison

For each element of the hierarchy structure all the associated elements in low hierarchy are compared in to attributes comparison matrices as follows:

$$A = \begin{pmatrix} 1 & \frac{w_1}{w_2} & \frac{w_1}{w_j} & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{1}{1} & \frac{w_2}{w_j} & \frac{w_2}{w_n} \\ \frac{w_j}{w_1} & \frac{w_j}{w_2} & \frac{1}{1} & \frac{w_i}{w_n} \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \frac{w_n}{w_i} & \frac{1}{1} \end{pmatrix}$$

Where A = comparison pairwise matrix,
w_1 = wheight of element 1,
w_2= wheight of element 2,
w_i = wheight of element I,
w_j = wheight of element j,
w_n = wheight of element n.

in order to determine the relative preferences for two elements of the hierarchy in matrix A, an underlying semantical scale is employs with values from 1 to 9 to rate (Table 1).

Preferences expressed in numeric variables	Preferences expressed in linguistic variables
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediate values between adjacent scale values

2.6. **Estimate the relative weights**

Some methods like eigenvalue method are used to calculate the relative weights of elements in each pairwise comparison matrix. The relative weights (W) of matrix A is obtained from following equation:

$$(A - \lambda_{max} I) X\ W = 0$$

Where λmax = the biggest eigenvalue of matrix A,

I = unit matrix.

2.7. **Check the consistency**

In this step the consistency property of matrices is checked to ensure that the judgments of decision makers are consistent. For this end some pre-parameter is needed. Consistency Index (*CI*) is calculated as:

$CI = \frac{\lambda_{max} - n}{n-1}$

The consistency index of a randomly generated reciprocal matrix shall be called to the random index (*RI*), with reciprocals forced. An average *RI* for the matrices of order 1–15 was generated by using a sample size of 100 [18]. The table of random indexes of the matrices of order 1–15 can be seen in Saaty (1980). The last ratio that has to be calculated is *CR* (Consistency Ratio). Generally, if *CR* is less than 0.1, the judgments are consistent, so the derived weights can be used. The formulation of *CR* is:

$CR = \frac{CI}{RI}$

2.8. **Obtain the overall rating**

In last step the relative weights of decision elements are aggregated to obtain an overall rating for the alternatives as follow:

$W_i^s = \sum_{j=1}^{j=m} W_{ij}^s w_j^a$

Where W_i^s *is total weight of site i*

W_{ij}^s : *weight of Alternatives (site) i*

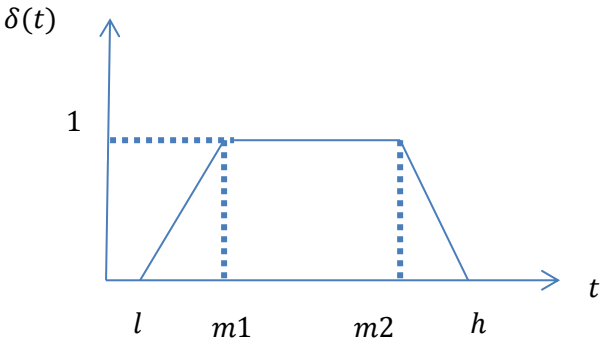
Associated to Attribute j (map layer)

w_j^a : *Weight of attribute j*

m :number of attribute

n : number of site

3. FAHP



3.2.1 Fuzzy Trapézoïdal Function

$$\delta(t) = \begin{cases} 0 & si \quad 0 < t < l \quad or \quad h < t \\ \frac{m1 - l}{t - l} & si \; l < t < m1 \\ 1 \quad si & m1 < t < m2 \\ \frac{h - m2}{t - h} & si \; m2 < t < h \end{cases}$$

There are more Fuzzy operation applied in this domain , we considered two Operand A and B;

$A = (a, b, c, d)$

$B = (e, f, g, p)$ Then

$A \boxplus B = (a + e, b + f, c + g, d + p)$

$A \boxminus B = (a - e, b - f, c - g, d - p)$

$A \boxtimes B = (a * e, b * f, c * g, d * p)$

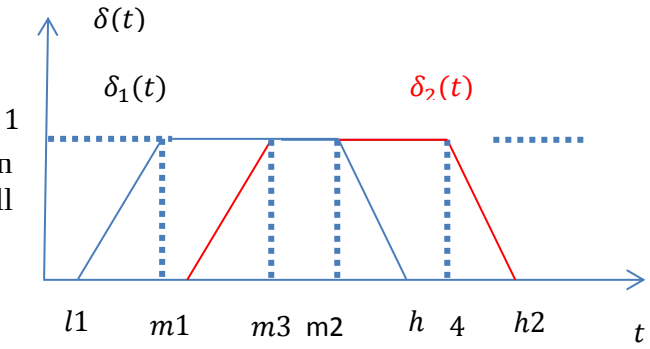
$A \oslash B = (a/e, b/f, c/g, d/p)$

Let considered $\delta^i(x1) = \sum_{i=1}^{n} \delta_i(x)$ Then :

$\delta_1 = TRAP(l1, m1, m2, h1)$;

$\delta_2 = TRAP(l2, m3, m4, h2)$,

here Representation is below :



$$\sum_{i=1}^{n} \sum_{j=1}^{m} \delta_{g_i}^j = \sum_{i=1}^{n} \left(\sum_{i=1}^{n} l_i , \sum_{i=1}^{n} m_{2*i+1} , \sum_{i=1}^{n} m_{2*i} , \sum_{i=1}^{n} h_i \right)$$

$$\left(\sum_{i=1}^{n} \sum_{j=1}^{m} \delta_{g_i}^j\right)^{-1} = \left(\frac{1}{\sum_{i=1}^{n} h_i} , \frac{1}{\sum_{i=1}^{n} m_{2*i}} , \frac{1}{\sum_{i=1}^{n} m_{2*i+1}} , \frac{1}{\sum_{i=1}^{n} l_i} \right)$$

IV. PROPOSED APPROACH

In this section, we present the main aspect of our contribution. As mentioned in the previous section, Salem Chakhar [1] in proposes three integration modes, indirect integration, built-in integration and full integration. In this paper a mixed integration is proposed: Preparing geographic criteria to support decision

making in weighting is made by GIS independently (indirect integration) in screening phase while visualization function is integrated directly (full integration) in the MCDA module in the evaluation phase and is considered as a finality of the decision analysis.

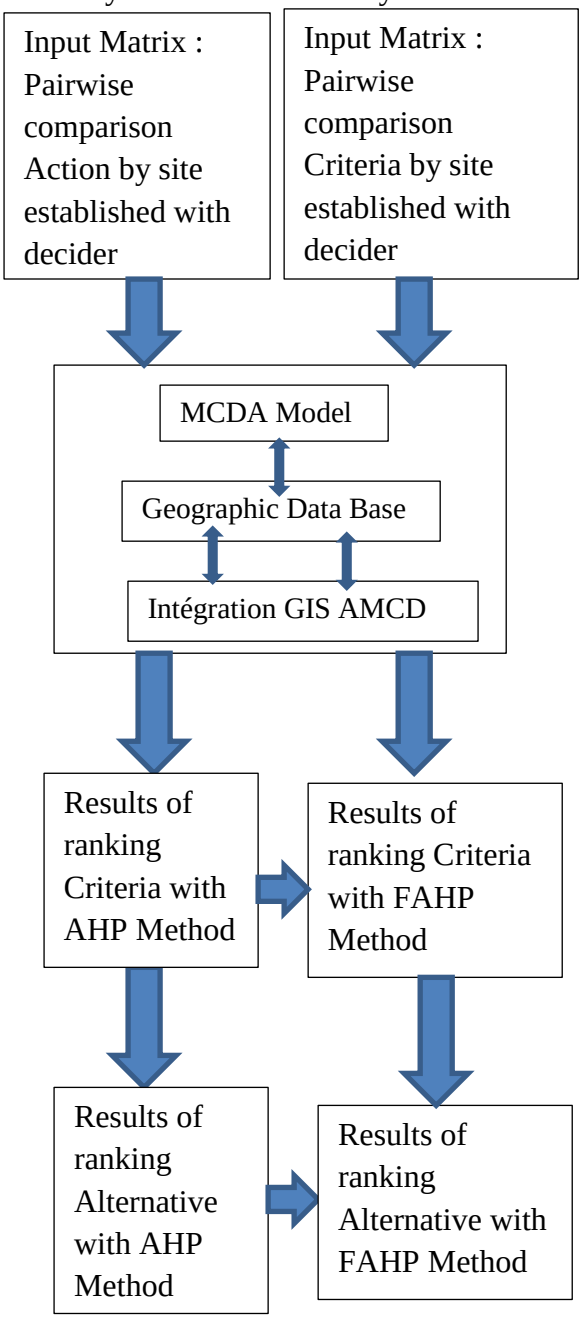


Figure 4 : Our Model MCDA

The proposed approach consists of two phases: Screening and evaluation as explained below and depicted in (Fig. 3)

• Screening phase: After the choice of Criteria number level one, Criteria number level two, Criteria number three, Action Number, at the beginning of the decision-making process, zones studies begins by collecting data about criteria and actions from geographic, socioeconomic and climate databases as archives of regions, the maps for the criteria are built using GIS. A field of expertise is available. Then with Our Interface , we can displaying the problem representing as tree

* The AHP procedure involves six essential steps [2, 3]:

1. Definition of the problem
2. Represent the problem by an hierarchy structure
3. Construct pairwise comparison matrixes
4. Estimate the relative weights
5. Check the consistance

Figure 03 : Introduction Input

After input data , we will displaying :

1. Tree representation
2. Ranking Criteria level one with AHP Method
3. Ranking Criteria level two with AHP Method
4. Ranking Action with AHP Method
5. Ranking Criteria level one with FAHP Method
6. Ranking Criteria level two with FAHP Method
7. Ranking Action with FAHP Method
8. Visualization site with mapping

Tree representation

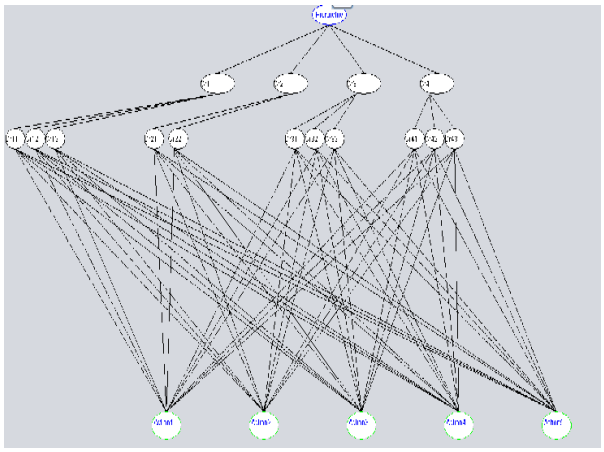


Figure 05 : Tree Decision representation

In this hierarchy there are Four (4) Criteria in level one and in the First Criteria there are three Criteria of level two, In the Second Criteria there are two Criteria level two, in the third criteria of level one, there are three Criteria of level two, Finally the fourth criteria have three criteria of level two, then this hierarchy has four actions.

Then we can say that the First Criteria is environmental impact Criteria , the second Criteria is represented by the natural hazard Criteria, The third Criteria is climate , Finally the fourth criteria is Socio economy

We have study her variability with Normalization, also firstly I have posed SAATY ponderation for the fourth Criteria like below:

1. Saaty Pairwise of Criteria level one in the Naama City

CT1	IE	NH	C	S	%	Rang
IE	1	1/7	3	1/3	0.22	4
NH	7	1	1/7	½	2.16	3
C	1/3	7	1	1/3	2.16	2
S	3	2	3	1	2.25	1

IE : environmental impact Criteria
NH : natural hazard Criteria
C : Climate Criteria
S: Socio Economic Criteria

2. Saaty Pairwise of Criteria level one in the Horchaia City

CT2	IE	NH	C	S	%	Rg
IE	1	1/2	4	1/3	1.4	3
NH	2	1	7	1/3	2.5	1
C	1/4	1/7	1	1/2	0.4	4
S	3	3	2	1	2.2	2

3. Saaty Pairwise of Criteria level one in Ras ElMa City

CT3	IE	NH	C	S	%	Rg
IE	1	1/3	1	1/2	0.7	4
NH	3	1	1/9	1/3	1.1	3
C	1	9	1	1/4	2.8	1
S	2	3	4	1	2.5	2

4. Saaty Pairwise of Criteria level one in Maghnia City

CT4	IE	NH	C	S	%	Rg
IE	1	1/9	2	1/4	0.8	4
NH	9	1	1/5	½	2.6	1
C	1/2	5	1	1	1.8	3
S	4	3	1	1	2.2	2

This Ponderation has been injected by the decider , In the second level , we found three Sub-Criteria (C1,C2,C3) in IE, two Sub-Criteria (C4,C5) in NH, Three Sub-Criteria (C6,C7,C8) in C, Finally Three Sub Criteria (C9,C10,C11) in S.

Now , The decider is invited to resolve The Sub-Criteria Ponderation

Ponderation of Sub-Criteria in IE

IE	C1	C2	C3	%	Rg
C1	1	5	5	3.6	1
C2	1/5	1	1	0.7	2
C3	1/5	1	1	0.7	2

C1 : Pollution risk water table
C2 : Fauna and Flora
C3 : Citizen noise pollution

Pairwise of Sub-Criteria in NH

NH	C4	C5	%	Rg
C4	1	5	3	1
C5	1/5	1	0.56	2

C4: Seismicity
C5 : Flood

Pairwise of sub-Criteria in C

C	C6	C7	C8	%	Rg
C6	1	3	3	2.33	1
C7	1/3	1	3	1.44	2
C8	1/3	1/3	1	0.5	3

C6 : Temperature
C7 : pluviometry
C8 : Bioclimatic floor

Pairwise of sub-Criteria in S

S	C9	C10	C11	%	Rg
C9	1	1/3	1/5	0.48	3
C10	3	1	3	2.33	1
C11	5	1/3	1	2.11	2

C9 : Development cost
C10 : Development potential
C11 : Transport infrastructure
Then , the decider pandurate the Action as below :

Pairwise Of Action in C1 :

C1	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1	1	1/2	2	1.1
CT2	1	1	1	1/3	1	0.86
CT3	1	1	1	1/2	1	0.9
CT4	2	3	2	1	2	2
CT5	1/2	1	1	1/2	1	0.8

Pairwise Of Action in C2 :

C2	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1/5	1/3	1/3	1/4	0.4
CT2	5	1	1/2	1	1/2	1.6
CT3	3	2	1	1	1/2	1.5
CT4	3	1	1	1	1/2	1.3
CT5	4	2	2	2	1	2.2

Pairwise Of Action in C3

C3	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	5	4	3	5	3.6
CT2	1/5	1	1/2	1/3	1/2	0.49
CT3	¼	2	1	1/2	4	1.51
CT4	1/3	3	2	1	5	2.26
CT5	1/5	2	¼	1/5	1	0.69

Pairwise of Action in C4

C4	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1	1	1	3	1.4
CT2	1	1	1	1	3	1.75
CT3	1	1	1	1	3	1.75
CT4	1	1	1	1	3	1.75
CT5	1/3	1/3	1/3	1/3	1	0.46

Pairwise of Action in C5

C5	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1/2	1/3	1/4	2	0.81
CT2	2	1	1/2	1/3	1	0.96
CT3	3	2	1	1/2	2	1.7
CT4	4	3	2	1	3	2.6
CT5	1/2	1	½	1/3	1	0.66

Pairwise of Action in C6

C6	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	3	2	1	2	1.8
CT2	1/3	1	3	3	5	2.46
CT3	½	1/3	1	1/2	1	0.66
CT4	1	1/3	2	1	2	1.26
CT5	1/2	1/5	1	1/2	1	0.62

Pairwise of Action in C7

C7	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	3	1/3	1/2	7	2.36
CT2	1/3	1	1/4	1/2	6	1.61
CT3	3	4	1	2	8	3.6
CT4	2	2	½	1	6	2.3
CT5	1/7	1/6	1/8	1/6	1	0.31

Pairwise of Action in C8

C8	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1	1	1	3	1.4
CT2	1	1	1	1	3	1.4
CT3	1	1	1	1	3	1.4
CT4	1	1	1	1	3	1.4
CT5	1/3	1/3	1/3	1/3	1	0.46

Pairwise of Action in C9

C9	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	1/3	2	1/3	1/5	0.75
CT2	3	1	5	3	1/3	2.46
CT3	½	1/5	1	1/2	1/5	0.44
CT4	3	3	1/3	1	6	2.66
CT5	5	3	5	1/6	1	2.82

Pairwise of Action in C10

C10	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	5	1	2	3	2.4
CT2	1/5	1	1/5	3	2	1.28
CT3	1	5	1	1/3	3	2.06
CT4	1/2	1/3	3	1	4	1.76
CT5	1/3	1/2	1/3	1/4	1	0.48

Pairwise of Action in C11

C11	CT1	CT2	CT3	CT4	CT5	Rg
CT1	1	5	1	1	3	2.2
CT2	1/5	1	1/5	1/5	2	0.72
CT3	1	5	1	1	3	2.2
CT4	1	5	1	1	3	2.2
CT5	1/3	½	1/3	1/3	1	0.5

Deduction of Alternative AHP Rang

$$\boldsymbol{Rang}(\boldsymbol{CT1}) = (((\boldsymbol{IE} * \boldsymbol{C1} * \boldsymbol{CT1}) + (\boldsymbol{IE} * \boldsymbol{C2} * \boldsymbol{CT1}) + (\boldsymbol{IE} * \boldsymbol{C3} * \boldsymbol{CT1})) + ((\boldsymbol{NH} * \boldsymbol{C4} * \boldsymbol{CT1}) + (\boldsymbol{NH} * \boldsymbol{C5} * \boldsymbol{CT1})) +$$

$$\big((\boldsymbol{C}*\boldsymbol{C6}*\boldsymbol{CT1})+(\boldsymbol{C}*\boldsymbol{C7}*\boldsymbol{CT1})+(\boldsymbol{C}*\boldsymbol{C8}*\boldsymbol{CT1})+(\boldsymbol{S}*\boldsymbol{C9}*\boldsymbol{CT1})+(\boldsymbol{S}*\boldsymbol{C10}*\boldsymbol{CT1})+(\boldsymbol{S}*\boldsymbol{C11}*\boldsymbol{CT1})\big)=\big((\mathbf{0.22}*\mathbf{3.6}*\mathbf{1.1})+(\mathbf{1.4}*\mathbf{0.7}*\mathbf{0.4})+(\mathbf{0.7}*\mathbf{0.7}*\mathbf{0.6})+(\mathbf{2.16}*\mathbf{3}*\mathbf{1.4})+(\mathbf{2.5}*\mathbf{0.56}*\mathbf{0.81})+(\mathbf{2.16}*\mathbf{2.33}*\mathbf{1.8})+(\mathbf{0.4}*\mathbf{1.44}*\mathbf{3.36})+(\mathbf{2.8}*\mathbf{0.5}*\mathbf{1.4})+(\mathbf{2.25}*\mathbf{0.48}*\mathbf{0.75})+(\mathbf{2.2}*\mathbf{2.33}*\mathbf{2.4})+(\mathbf{2.5}*\mathbf{2.11}*\mathbf{2.2})\big)=\mathbf{49.43/220}=\mathbf{0.21}$$

$$\boldsymbol{Rang}(\boldsymbol{CT2})=\big(\big((\boldsymbol{IE}*\boldsymbol{C1}*\boldsymbol{CT2})+(\boldsymbol{IE}*\boldsymbol{C2}*\boldsymbol{CT2})+(\boldsymbol{IE}*\boldsymbol{C3}*\boldsymbol{CT2})\big)+\big((\boldsymbol{NH}*\boldsymbol{C4}*\boldsymbol{CT2})+(\boldsymbol{NH}*\boldsymbol{C5}*\boldsymbol{CT2})\big)+\big((\boldsymbol{C}*\boldsymbol{C6}*\boldsymbol{CT2})+(\boldsymbol{C}*\boldsymbol{C7}*\boldsymbol{CT2})+(\boldsymbol{C}*\boldsymbol{C8}*\boldsymbol{CT2})+(\boldsymbol{S}*\boldsymbol{C9}*\boldsymbol{CT2})+(\boldsymbol{S}*\boldsymbol{C10}*\boldsymbol{CT2})+(\boldsymbol{S}*\boldsymbol{C11}*\boldsymbol{CT2})\big)=\big((\mathbf{0.22}*\mathbf{3.6}*\mathbf{0.86})+(\mathbf{1.4}*\mathbf{0.7}*\mathbf{1.6})+(\mathbf{0.7}*\mathbf{0.7}*\mathbf{0.49})+(\mathbf{2.16}*\mathbf{3}*\mathbf{1.75})+(\mathbf{2.5}*\mathbf{0.56}*\mathbf{0.96})+(\mathbf{2.16}*\mathbf{2.33}*\mathbf{2.48})+(\mathbf{0.4}*\mathbf{1.44}*\mathbf{1.61})+(\mathbf{2.8}*\mathbf{0.5}*\mathbf{1.4})+(\mathbf{2.25}*\mathbf{0.48}*\mathbf{2.46})+(\mathbf{2.2}*\mathbf{2.33}*\mathbf{1.28})+(\mathbf{2.5}*\mathbf{2.11}*\mathbf{0.72})\big)=(\mathbf{43.56})/\mathbf{220}=\mathbf{0.2}$$

$$\boldsymbol{Rang}(\boldsymbol{CT3})=\big(\big((\boldsymbol{IE}*\boldsymbol{C1}*\boldsymbol{CT3})+(\boldsymbol{IE}*\boldsymbol{C2}*\boldsymbol{CT3})+(\boldsymbol{IE}*\boldsymbol{C3}*\boldsymbol{CT3})\big)+\big((\boldsymbol{NH}*\boldsymbol{C4}*\boldsymbol{CT3})+(\boldsymbol{NH}*\boldsymbol{C5}*\boldsymbol{CT3})\big)+\big((\boldsymbol{C}*\boldsymbol{C6}*\boldsymbol{CT3})+(\boldsymbol{C}*\boldsymbol{C7}*\boldsymbol{CT3})+(\boldsymbol{C}*\boldsymbol{C8}*\boldsymbol{CT3})+(\boldsymbol{S}*\boldsymbol{C9}*\boldsymbol{CT3})+(\boldsymbol{S}*\boldsymbol{C10}*\boldsymbol{CT3})+(\boldsymbol{S}*\boldsymbol{C11}*\boldsymbol{CT3})\big)=\big((\mathbf{0.22}*\mathbf{3.6}*\mathbf{0.9})+(\mathbf{1.4}*\mathbf{0.7}*\mathbf{1.5})+(\mathbf{0.7}*\mathbf{0.7}*\mathbf{1.51})+(\mathbf{2.16}*\mathbf{3}*\mathbf{1.75})+(\mathbf{2.5}*\mathbf{0.56}*\mathbf{1.7})+(\mathbf{2.16}*\mathbf{2.33}*\mathbf{0.66})+(\mathbf{0.4}*\mathbf{1.44}*\mathbf{3.6})+(\mathbf{2.8}*\mathbf{0.5}*\mathbf{1.4})+(\mathbf{2.25}*\mathbf{0.48}*\mathbf{0.44})+(\mathbf{2.2}*\mathbf{2.33}*\mathbf{2.06})+(\mathbf{2.5}*\mathbf{2.11}*\mathbf{2.2})\big)=\frac{\mathbf{60}}{\mathbf{220}}=\mathbf{0.27}$$

$$\boldsymbol{Rang}(\boldsymbol{CT4})==\big(\big((\boldsymbol{IE}*\boldsymbol{C1}*\boldsymbol{CT4})+(\boldsymbol{IE}*\boldsymbol{C2}*\boldsymbol{CT4})+(\boldsymbol{IE}*\boldsymbol{C3}*\boldsymbol{CT4})\big)+\big((\boldsymbol{NH}*\boldsymbol{C4}*\boldsymbol{CT4})+(\boldsymbol{NH}*\boldsymbol{C5}*\boldsymbol{CT4})\big)+\big((\boldsymbol{C}*\boldsymbol{C6}*\boldsymbol{CT4})+(\boldsymbol{C}*\boldsymbol{C7}*\boldsymbol{CT4})+(\boldsymbol{C}*\boldsymbol{C8}*\boldsymbol{CT4})+(\boldsymbol{S}*\boldsymbol{C9}*\boldsymbol{CT4})+(\boldsymbol{S}*\boldsymbol{C10}*\boldsymbol{CT4})+(\boldsymbol{S}*\boldsymbol{C11}*\boldsymbol{CT4})\big)=\big((\mathbf{0.22}*\mathbf{3.6}*\mathbf{2})+(\mathbf{1.4}*\mathbf{0.7}*\mathbf{1.3})+(\mathbf{0.7}*\mathbf{0.7}*\mathbf{2.26})+(\mathbf{2.16}*\mathbf{3}*\mathbf{1.75})+(\mathbf{2.5}*\mathbf{0.56}*\mathbf{2.6})+(\mathbf{2.16}*\mathbf{2.33}*\mathbf{1.26})+(\mathbf{0.4}*\mathbf{1.44}*\mathbf{2.3})+(\mathbf{2.8}*\mathbf{0.5}*\mathbf{1.4})+(\mathbf{2.25}*\mathbf{0.48}*\mathbf{2.66})+(\mathbf{2.2}*\mathbf{2.33}*\mathbf{1.76})+(\mathbf{2.5}*\mathbf{2.11}*\mathbf{2.2})\big)=\frac{\mathbf{45.72}}{\mathbf{220}}=\mathbf{0.2}$$

$$\boldsymbol{Rang}(\boldsymbol{CT5})=\big(\big((\boldsymbol{IE}*\boldsymbol{C1}*\boldsymbol{CT5})+(\boldsymbol{IE}*\boldsymbol{C2}*\boldsymbol{CT5})+(\boldsymbol{IE}*\boldsymbol{C3}*\boldsymbol{CT5})\big)+\big((\boldsymbol{NH}*\boldsymbol{C4}*\boldsymbol{CT5})+(\boldsymbol{NH}*\boldsymbol{C5}*\boldsymbol{CT5})\big)+\big((\boldsymbol{C}*\boldsymbol{C6}*\boldsymbol{CT5})+(\boldsymbol{C}*\boldsymbol{C7}*\boldsymbol{CT5})+(\boldsymbol{C}*\boldsymbol{C8}*\boldsymbol{CT5})+(\boldsymbol{S}*\boldsymbol{C9}*\boldsymbol{CT5})+(\boldsymbol{S}*\boldsymbol{C10}*\boldsymbol{CT5})+(\boldsymbol{S}*\boldsymbol{C11}*\boldsymbol{CT5})\big)=\big((\mathbf{0.22}*\mathbf{3.6}*\mathbf{0.8})+(\mathbf{1.4}*\mathbf{0.7}*\mathbf{2.2})+(\mathbf{0.7}*\mathbf{0.7}*\mathbf{0.69})+(\mathbf{2.16}*\mathbf{3}*\mathbf{0.46})+(\mathbf{2.5}*\mathbf{0.56}*\mathbf{0.66})+(\mathbf{2.16}*\mathbf{2.33}*\mathbf{0.62})+(\mathbf{0.4}*\mathbf{1.44}*\mathbf{0.31})+(\mathbf{2.8}*\mathbf{0.5}*\mathbf{0.46})+(\mathbf{2.25}*\mathbf{0.48}*\mathbf{2.82})+(\mathbf{2.2}*\mathbf{2.33}*\mathbf{0.48})+(\mathbf{2.5}*\mathbf{2.11}*\mathbf{0.5})\big)=\frac{\mathbf{46.2}}{\mathbf{220}}=\mathbf{0.21}$$

AHP Ranking

Action (City)	% Rate	Ranking
CT1 (Naama)	0.21	2
CT2(Horchaia)	0.20	4
CT3 (Ras Elma)	0.27	1
CT4 (Kolea)	0.2	5
CT5 (Maghnia)	0.21	3

Fuzzy deduction From Pairwise

1. Fuzzy Ponderation of Criteria level one in the Naama City

CT1	IE	NH	C	S
IE	(1,1,1,1)	(1/8,1/7,1/6)	(2,3,4,5)	(1/4,1/3,1/2,1)
NH	(6,7,8,9)	(1,1,1,1)	(1/8,1/7,1/6,1/5)	(1/3,½,1,1)
C	(¼,1/3,1/2,1)	(6,7,8,9)	(1,1,1,1)	(1/4,1/3,1/2,1)
S	(2,3,4,5)	(1,2,3,4)	(2,3,4,5)	(1,1,1,1)

IE : environmental impact Criteria
NH : natural hazard Criteria
C : Climate Criteria
S: Socio Economic Criteria

2. Fuzzy Ponderation of Criteria level one in the Horchaia City (CT2)

CT2	IE	NH	C	S
IE	(1,1,1,1)	(1/3,1/2,1,1)	(3,4,5,6)	(1/4,1/3,1/2,1)
NH	(1,2,3,4)	(1,1,1,1)	(6,7,8,9)	(¼,1/3,1/2,1)
C	(1/3,1/4,1/2,1)	(1/8,1/7,1/6,1/5)	(1,1,1,1)	(1/3,1/2,1,1)
S	(2,3,4,5)	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)

3. Fuzzy Ponderation of Criteria level one in Ras ElMa

4. City

CT3	IE	NH	C	S
IE	(1,1,1,1)	(1/4,1/3,1/2,1)	(1,1,1,1)	(1/3,1/2,1,1)
NH	(2,3,4,5)	(1,1,1,1)	(1/10,1/9,1/8,1/7)	(1/4,1/3,1/2,1)
C	(1,1,1,1)	(8,9,10,11)	(1,1,1,1)	(1/5,1/4,1/3,1/2)
S	(1,2,3,4)	(2,3,4,5)	(3,4,5,6)	(1,1,1,1)

5. Fuzzy Ponderation of Criteria level one in Maghnia City

CT4	IE	NH	C	S
IE	(1,1,1,1)	(1/10,1/9,1/8,1/7)	(1,2,3,4)	(1/4,1/3,1/2,1)
NH	(8,9,10,11)	(1,1,1,1)	(1/6,1/5,1/4,1/3)	(1/3,½,1,1)
C	(1/3,1/2,1,1)	(4,5,6,7)	(1,1,1,1)	(1,1,1,1)
S	(3,4,5,6)	(2,3,4,5)	(1,1,1,1)	(1,1,1,1)

Now , The decider is invited to resolve The Sub-Criteria Ponderation

Ponderation of Sub-Criteria in IE

IE	C1	C2	C3
C1	(1,1,1,1)	(4,5,6,7)	(4,5,6,7)
C2	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1,1,1,1)
C3	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1,1,1,1)

C1 : Pollution risk water table
C2 : Fauna and Flora
C3 : Citizen noise pollution

Fuzzy Ponderation of Sub-Criteria in NH

NH	C4	C5
C4	(1,1,1,1)	(4,5,6,7)
C5	(1/6,1/5,1/4,1/3)	(1,1,1,1)

C4: Seismicity
C5 : Flood

Fuzzy Ponderation of sub-Criteria in C

C	C6	C7	C8
C6	(1,1,1,1)	(2,3,4,5)	(2,3,4,5)
C7	(¼,1/3,1/2,1)	(1,1,1,1)	(2,3,4,5)
C8	(1/4,1/3,1/2,1)	(1/4,1/3,1/2,1)	(1,1,1,1)

C6 : Temperature
C7 : pluviometry
C8 : Bioclimatic floor

Fuzzy Ponderation of sub-Criteria in S

S	C9	C10	C11
C9	(1,1,1,1)	(¼,1/3,1/2,1)	(1/6,1/5,1/4,1/3)
C10	(2,3,4,5)	(1,1,1,1)	(2,3,4,5)
C11	(4,5,6,7)	(1/4,1/3,1/2,1)	(1,1,1,1)

C9 : Development cost
C10 : Development potential
C11 : Transport infrastructure

Then , the decider pandurate the Action as below :

Fuzzy Ponderation Of Action in C1

C1	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1/3,1/2,1,1)	(1,2,3,4)
CT2	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(¼,1/3,1/2,1)	(1,1,1,1)
CT3	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1/3,1/2,1,1)	(1,1,1,1)
CT4	(1,2,3,4)	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(1,2,3,4)
CT5	(1/3,1/2,1,1)	(1,1,1,1)	(1,1,1,1)	(1/3,1/2,1,1)	(1,1,1,1)

Fuzzy **Ponderation Of Action in C2 :**

C2	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(1/6,1/5,1/4,1/3)	(¼,1/3,1/2,1)	(1/4,1/3,1/2,1)	(1/5,1/4,1/3,1/2)
CT2	(4,5,6,7)	(1,1,1,1)	(1/3,1/2,1,1)	(1,1,1,1)	(1/3,1/2,1,1)
CT3	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(1,1,1,1)	(1/3,1/2,1,1)
CT4	(2,3,4,5)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1/3,1/2,1,1)
CT5	(3,4,5,6)	(1,2,3,4)	(1,2,3,4)	(1,2,3,4)	(1,1,1,1)

Fuzzy Ponderation Of Action in C3

C3	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(4,5,6,7)	(3,4,5,6)	(2,3,4,5)	(4,5,6,7)
CT2	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1/3,1/2,1,1)	(¼,1/3,1/2,1)	(1/3,1/2,1,1)
CT3	(1/5,¼,1/3,1/2)	(1,2,3,4)	(1,1,1,1)	(1/3,1/2,1,1)	(3,4,5,6)
CT4	(¼,1/3,1/2,1)	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(4,5,6,7)
CT5	(1/6,1/5,1/4,1/3)	(1,2,3,4)	(½,¼,1/3,1/2)	(1/6,1/5,1/4,1/3)	(1,1,1,1)

Fuzzy Ponderation of Action in C4

C4	CT1CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT2	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT3	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT4	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT5	(¼,1/3,1/2,1)	(¼,1/3,1/2,1)	(¼,1/3,1/2,1)	(¼,1/3,1/2,1)	(1,1,1,1)

Fuzzy Ponderation of Action in C5

C5	CT1CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(1/3,1/2,1,1)	(¼,1/3,1/2,1)	(1/5,1/4,1/3,1/2)	(1,2,3,4)
CT2	(1,2,3,4)	(1,1,1,1)	(1/3,½,1,1)	(¼,1/3,1/2,1)	(1,1,1,1)
CT3	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(1/3,½,1,1)	(1,2,3,4)
CT4	(3,4,5,6)	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(2,3,4,5)
CT5	(1/3,1/2,1,1)	(1,1,1,1)	(1/3,½,1,1)	(¼,1/3,1/2,1)	(1,1,1,1)

Fuzzy Ponderation of Action in C6

C6	CT1CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(2,3,4,5)	(1,2,3,4)	(1,1,1,1)	(1,2,3,4)
CT2	(¼,1/3,1/2,1)	(1,1,1,1)	(2,3,4,5)	(2,3,4,5)	(4,5,6,7)
CT3	(1/3,½,1,1)	(¼,1/3,1/2,1)	(1,1,1,1)	(1/3,½,1,1)	(1,1,1,1)
CT4	(1,1,1,1)	(¼,1/3,1/2,1)	(1,2,3,4)	(1,1,1,1)	(1,2,3,4)
CT5	(1/3,1/2,1,1)	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1/3,1/2,1,1)	(1,1,1,1)

Ponderation of Action in C7

C7	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(2,3,4,5)	(¼,1/3,1/2,1)	(1/3,1/2,1,1)	(6,7,8,9)
CT2	(¼,1/3,1/2,1)	(1,1,1,1)	(1/5,¼,1/3,1/2)	(1/3,1/2,1,1)	(5,6,7,8)
CT3	(2,3,4,5)	(3,4,5,6)	(1,1,1,1)	(1,2,3,4)	(7,8,9,10)
CT4	(1,2,3,4)	(1,2,3,4)	(1/3,½,1,1)	(1,1,1,1)	(5,6,7,8)
CT5	(1/8,1/7,1/6,1/5)	(1/7,1/6,1/5,1/4)	(1/9,1/8,1/7,1/6)	(1/7,1/6,1/5,1/4)	(1,1,1,1)

	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	Close12	Close13	Close14	Close15
CT2	Close21	(1,1,1,1)	Close 23	Close24	Close25
CT3	Close31	Close32	(1,1,1,1)	Close34	Close35
CT4	Close41	Close42	Close43	(1,1,1,1)	Close45
CT5	Close51	Close52	Close53	Close54	(1,1,1,1,)

Calculate of Fuzzy Weight between different cities

Ponderation of Action in C8

C8	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT2	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT3	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT4	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT5	(¼, 1/3,1/2,1)	(¼,1/3,1/2,1)	(¼,1/3,1/2,1)	(1/4,1/3,1/2,1)	(1,1,1,1)

$Let\ x(y,z) fonction\ defined\ as\ below$:

x : $Fuzzy\ argument\ number$ **function**
y : **first Intitule cities of Comparison**
y : **Second Intitule cities of Comparison**
Application
$x(y,z) = x(y) * x(z)$;
$y(y,z) = y(y) * y(z)$;
$z(y,z) = z(y) * z(z)$;

Ponderation of Action in C9

C9	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(¼,1/3,1/2,1)	(1,2,3,4)	(¼,1/3,1/2,1)	(1/6,1/5,1/4,1/3)
CT2	(2,3,4,5)	(1,1,1,1)	(4,5,6,7)	(2,3,4,5)	(¼,1/3,1/2,1)
CT3	(1/3,½,1,1)	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1/3,1/2,1,1)	(1/6,1/5,1/4,1/3)
CT4	(2,3,4,5)	(2,3,4,5)	(¼,1/3,1/2,1)	(1,1,1,1)	(5,6,7,8)
CT5	(4,5,6,7)	(2,3,4,5)	(4,5,6,7)	(1/7,1/6,1/5,1/4)	(1,1,1,1)

$$\begin{cases} 1(CT2, CT1) = 0.002 \\ 2(CT2, CT1) = 0.02 \\ 3(CT2, CT1) = 0.18 \\ 4(CT2, CT1) = 0.18 \end{cases} - Close(2,1)$$

C10	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(4,5,6,7)	(1,1,1,1)	(1,2,3,4)	(2,3,4,5)
CT2	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1/6,1/5,1/4,1/3)	(2,3,4,5)	(1,2,3,4)
CT3	(1,1,1,1)	(4,5,6,7)	(1,1,1,1)	(¼,1/3,1/2,1)	(2,3,4,5)
CT4	(1/3,½,1,1)	(¼,1/3,1/2,1)	(2,3,4,5)	(1,1,1,1)	(3,4,5,6)
CT5	(¼,1/3,1/2,1)	(1/3,½,1,1)	(¼,1/3,1/2,1)	(1/3,¼,1/5,1/4)	(1,1,1,1)

$$\begin{cases} 1(CT3, CT1) = 0.44 \\ 2(CT3, CT1) = 2.25 \\ 3(CT3, CT1) = 4.5 \\ 4(CT3, CT1) = 20 \end{cases} - Close(3,1)$$

$$\begin{cases} 1(CT4, CT1) = 2 \\ 2(CT4, CT1) = 12 \\ 3(CT4, CT1) = 30 \\ 4(CT4, CT1) = 120 \end{cases} - Close(4,1)$$

Fuzzy Ponderation of Action in C10

Fuzzy Ponderation of Action in C11

C11	CT1	CT2	CT3	CT4	CT5
CT1	(1,1,1,1)	(4,5,6,7)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT2	(1/6,1/5,1/4,1/3)	(1,1,1,1)	(1/6,1/5,1/4,1/3)	(1/6,1/5,1/4),1/2)	(1,2,3,4)
CT3	(1,1,1,1)	(/4,5,6,7)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT4	(1,1,1,1)	(4,5,6,7)	(1,1,1,1)	(1,1,1,1)	(2,3,4,5)
CT5	(¼,1/3,1/2,1)	(1/3,½,1,1)	(¼,1/3,1/2,1)	(¼,1/3,1/2,1)	(1,1,1,1)

$$\begin{cases} 1(CT5, CT1) = 0.0002 \\ 2(CT5, CT1) = 0.0004 \\ 3(CT5, CT1) = 0.066 \\ 4(CT5, CT1) = 2.33 \end{cases} - Close(5,1)$$

$$\begin{cases} 1(CT1, CT2) = 2.66 \\ 2(CT1, CT2) = 12.5 \\ 3(CT1, CT2) = 78 \\ 4(CT1, CT2) = 245 \end{cases} - Close(1,2)$$

Fuzzy deduction

$$Rang_{Flou}(CTi) = \left(\left((IE_F \boxtimes C1_F \boxtimes CTi_F) \boxplus (IE_F \boxtimes C2_F \boxtimes CTi_F) \boxplus (IE_F \boxtimes C3_F \boxtimes CTi_F)\right) \boxplus \left((NH_F \boxtimes C4_F \boxtimes CTi_F) \boxplus (NH_F \boxtimes C5_F \boxtimes CTi_F)\right) \boxplus \left((C_F \boxtimes C6_F \boxtimes CTi_F) \boxplus (C_F \boxtimes C7_F \boxtimes CTi_F) \boxplus (C_F \boxtimes C8_F \boxtimes CTi_F) \boxplus (S_F \boxtimes C9_F \boxtimes CTi_F) \boxplus (S_F \boxtimes C10_F \boxtimes CTi_F) \boxplus (S_F \boxtimes C11_F \boxtimes CTi_F)\right)$$

$$\begin{cases} 1(CT3, CT2) = 0.5 \\ 2(CT3, CT2) = 2.66 \\ 3(CT3, CT2) = 11.25 \\ 4(CT3, CT2) = 56 \end{cases} - Close(3,2)$$

$$\begin{cases} 1(CT4, CT2) = 1.14 \\ 2(CT4, CT2) = 10 \\ 3(CT4, CT2) = 72 \\ 4(CT4, CT2) = 700 \end{cases} - Close(4,2)$$

$$\begin{cases} 1(CT5, CT2) = 0.0003 \\ 2(CT5, CT2) = 0.003 \\ 3(CT5, CT2) = 0.01 \\ 4(CT5, CT2) = 0.4 \end{cases} - Close(5,2)$$

$$\begin{cases} 1(CT1, CT3) = 0.25 \\ 2(CT1, CT3) = 1.33 \\ 3(CT1, CT3) = 4.5 \\ 4(CT1, CT3) = 16 \end{cases} - Close(1,3)$$

$$\begin{cases} 1(CT4, CT2) = 0.01 \\ 2(CT4, CT2) = 0.07 \\ 3(CT4, CT2) = 0.5 \\ 4(CT4, CT2) = 1.9 \end{cases} - Close(4,2)$$

$$\begin{cases} 1(CT4, CT3) = 0.16 \\ 2(CT4, CT3) = 1 \\ 3(CT4, CT3) = 6 \\ 4(CT4, CT3) = 20 \end{cases} - close(4,3)$$

$$\begin{cases} 1(CT5, CT3) = 0.001 \\ 2(CT5, CT3) = 0.008 \\ 3(CT5, CT3) = 0.03 \\ 4(CT5, CT3) = 1.1 \end{cases} - Close(5,3)$$

$$\begin{cases} 1(CT1, CT4) = 0.016 \\ 2(CT1, CT4) = 0.07 \\ 3(CT1, CT4) = 0.5 \\ 4(CT1, CT4) = 2 \end{cases} - Close(4,1)$$

$$\begin{cases} 1(CT2, CT4) = 0.4 \\ 2(CT2, CT4) = 2.7 \\ 3(CT2, CT4) = 16 \\ 4(CT2, CT4) = 41.66 \end{cases} - Close(2,4)$$

$$\begin{cases} 1(CT3, CT4) = 0.03 \\ 2(CT3, CT4) = 0.16 \\ 3(CT3, CT4) = 1.5 \\ 4(CT3, CT4) = 4 \end{cases} - Close(3,4)$$

$$\begin{cases} 1(CT5, CT4) = 0.0001 \\ 2(CT5, CT4) = 0.002 \\ 3(CT5, CT4) = 0.03 \\ 4(CT5, CT4) = 0.1 \end{cases} - Close(5,4)$$

$$\begin{cases} 1(CT1, CT5) = 8 \\ 2(CT1, CT5) = 75.6 \\ 3(CT1, CT5) = 424 \\ 4(CT1, CT5) = 1500 \end{cases} - Close(5,1)$$

$$\begin{cases} 1(CT2, CT5) = 20 \\ 2(CT2, CT5) = 360 \\ 3(CT2, CT5) = 4116 \\ 4(CT2, CT5) = 28800 \end{cases} Close(5,2)$$

$$\begin{cases} 1(CT3, CT5) = 18.66 \\ 2(CT3, CT5) = 259.2 \\ 3(CT3, CT5) = 1728 \\ 4(CT3, CT5) = 5000 \end{cases} Close(5,3)$$

$$\begin{cases} 1(CT4, CT5) = 600 \\ 2(CT4, CT5) = 2595 \\ 3(CT4, CT5) = 47040 \\ 4(CT4, CT5) = 192000 \end{cases} Close(5,4)$$

$x(CT_i, CT_i) = (1,1,1,1)$

This is the diagonal Close , Its for ALL time with one We have to combine All the possibilities included in table and Calculate with function x the Multiplication of

Fuzzy Deduction

	Fuzzy Weight				AHPw	Rank	%
CT1	2.4	18.1	101.6	352.8	118.7	4	0.8%
CT2	4.2	72.76	826.75	5769.10	1668.20	2	11%
CT3	4.126	51.04	349.25	1016.2	355.131	3	2%
CT4	120.06	525.4	9441.8	38568.2	12163.95	1	85%
CT5	0.20003	0.2023	0.2027	1.00	0.26	5	0.00018%

GIS visualization with Udig Annalyser

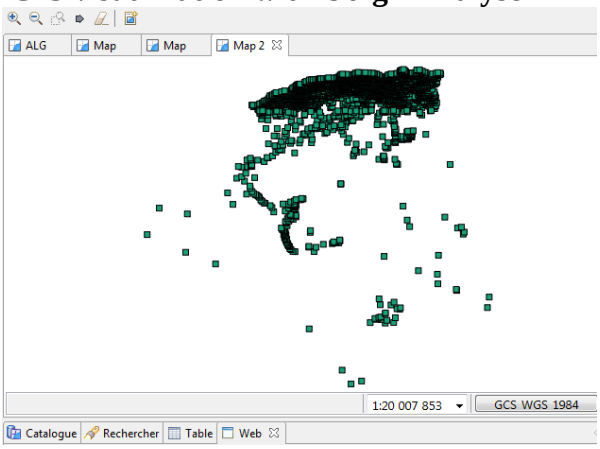


Figure 06 : Localization of Different Cities of Algeria Country

This Map have represented all Algerian Cities make on points , with Udig [18] , I have characterized The latitude and longitude coordinate by rectangle function of Algerian Map, it was projected with Udig, one of famous software simulation,

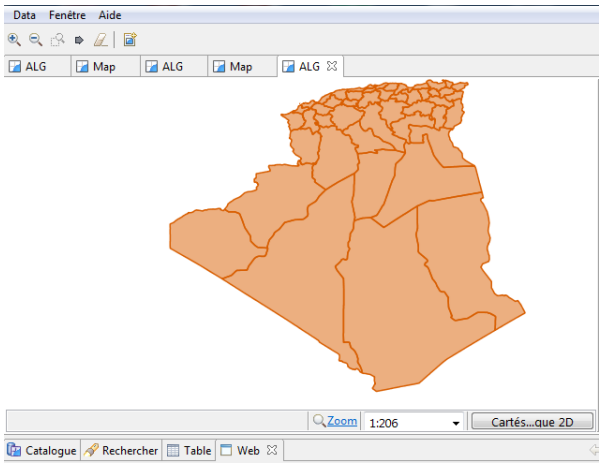


Figure 07: Administration Limitation of Algerian Cities

With Orange color, I have illustrate the Algerian Map to will determinate the borne and Limitation of each cities

Conclusion

In this paper I have proposed AHP Method then extension AHP , FAHP, and Trapezoidal model , GIS Cartography for the Algerian Industrial zone, Our Process for the decision making is based on :

1. Analysis of AHP Criteria one and second level of decision Tree
2. Analysis of AHP Alternatives on the final level in the decision Tree
3. Analysis of FAHP Criteria , the one and Second level in the decision tree
4. Analysis of FAHP of the Alternative decision in the final level on decision tree
5. Layer Visualizations of actions on GIS there are All Resource , Services and Low Favorite Climate

The final analysis had found that KOLEA (CT4) is the best Cities with Majority of Fuzzy Weight and AHP Weight to dominate The Choice Industrial Project , in another way , we Can compare the different Climate (Temperature, Climate, Socio Economic Criteria and Environmental Impact) for extract the Rank of each one by cities, also , In Algeria , I have selected The trapezoidal Function for largeness the domain of determination

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