Research Article

iMedPub Journals
www.imedpub.com

Journal of Environmental Research
ISSN

2021
Vol.5 No.2:1

Evaluate Health Risk for Instructional Environment by Fuzzy Topsis Method

Eghbal Sekhavati and Reza jalilzadeh yengejeh*

Department of Environmental Engineering, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

***Corresponding author:** Reza jalilzadeh yengejeh, Department of Environmental Engineering, , Islamic Azad University, , Ahvaz Branch, Ahvaz, Iran, Email: R.jalilzadeh@iauahvaz.ac.ir

Citation: Sekhavati E, yengejeh RJ (2021) Evaluate Health Risk for Instructional Environment by Fuzzy Topsis Method. J Environ Res Vol.5 No. 2:1

Received date: March 05, 2021; **Accepted date:** March 19, 2021; **Published date:** March 26, 2021

Abstract

Today, increment of population and technology development cause to increase many pollutions in human societies which have many effects on human health situation. Thus, it is necessary to pay attention coherent planning to reduce risk. Use of methods for evaluation of riskis an important instrument to control health risks. This research is performed to discuss status of health risks of Larestan factory. For this reason, fuzzy Topsis method was used which firstly, four health risks insights including (safety insight, safety performance, comprehend risk and evaluate risk) were discussed. According to results of estimation for Topsis fuzzy, threshold value for risk evaluation was estimated as 0.86, 0.726. The most suitable transmission variable is determined as risk evaluation, in other side; it was suitable pattern for risk transmission evaluation (t) for mild regression with LFUZZY TOPSIS. The findings help managers of occupations in order to reduce health potential risks and provide new insights to solve uncertain in management and control potential risks.

Keywords: Risk evaluation; Safety insight; Fuzzy topsis

Introduction

Increasing development of industries and establish new working environments need to promote safety level and prevent from events. In this regard, each telecommunication activity tolerates on bio environment which shall be probable risks as for nature of project and environment. Thus, in order to prevent from events, evaluation and management of health and environmental risks are imperative. In industrial environments, there are different dangerous factors which physical factors are important. One of the physical factors is air pollution that it is for industrial society which causes important safety and health risks in workshops and shall be considered to prevent probable risk. Air pollution is resulted to concentration of pollutants,

intensify inversion, air stability and distribute thermal regime and as result increase different cardiovascular diseases which are more in cold seasons. According to the last estimations, scale of cancerous pollutants due to population and industrial activities is 10 more than to Europe union standards in metropolitans like Shiraz and Tehran. The aim of risk management is to establish a systematic and continuous framework in order to identify, evaluate, delete, control, prevent and inform risk. Then, in risk management process, the decisions are taken in terms of compare results due to risk [1]. Risk evaluation is based on necessity of application of control actions in order to protect human forces. Therefore, as for health risk due to pollution of industries and telecommunications which are endanger people, it is necessary to pay attention optimization of health risk in order to help air pollution and optimize risk and its necessities.

Optimization and maintenance for many engineering, economic and social systems is necessary to minimize costs and maximize interest and because of vast in different sciences, it grows more. The most famous mathematical optimizations models are optimization by Fuzzy Topsis which is efficient model for health risk, performed researches on health and safety risk management in coalmines by fuzzy TOPSIS. In this study, three underground coal mines in Kerman were selected as case sample. This model can perform necessary actions to prevent from events [2]. 2014 prioritized and calculated all effective

factors which are environmental, engineering and economic factors to select equipment for control air pollution by designing select model equipment for air pollution control by helping fuzzy hierarchical analysis. The results showed that among main elements, economic model with weight 0.555 is recognized as most important effective criteria to select air control pollution and environmental and engineering scales are other ranks with weights 0.286 and 0.159. In 2009, a study namely evaluation of transmission companies for dangerous wastes by TOPSIS and AHP methods was performed. According to results, it is difficult to select most accurate and suitable transport company for producers of dangerous wastes which needs attention of safety authorities. In 2011 performed research as Fuzzy TOPSIS for group decisions, case study on oil in sea. They showed that selection of the best strategy to fight against oil in sea shall be evaluated by different values for each scale and forms multi scales decision problem. Multifaceted decision analysis (MCDA) is a collection of analytic methods which help managers to solve complicated and weak problems and use decision maker's knowledge and effective scales to solve them. There are different strategic approaches for MCDA which act successfully as for different problems. AHP is an acceptable decision factor which is used to determine relative importance in certain decision making. One of the most basic steps in each problem is to estimate dependent data[3]. AHP is based on pair comparison which is used to determine relative importance. Fuzzy TOPSIS method is most applied and famous method to rank options in fuzzy environment. The aim of present study is to evaluate building health risks using Fuzzy TOPSIS method.

Materials and Methods

One of the southern provinces in Fars province which had 221,000 populations in census of persons and housing in 2011 and population of Lar was 90,000. The shortest path to sea is 160 km from access to sea which connects it to Pol port but its distance minimizes to 97km by direct lane. Lar locates in north of and south of Fars, is strategic region because of military and economic factors and it is one of the entrance exit corridors because of north south bridge of Persian Gulf into open seas. Lar city is seen in **Figure 1**.

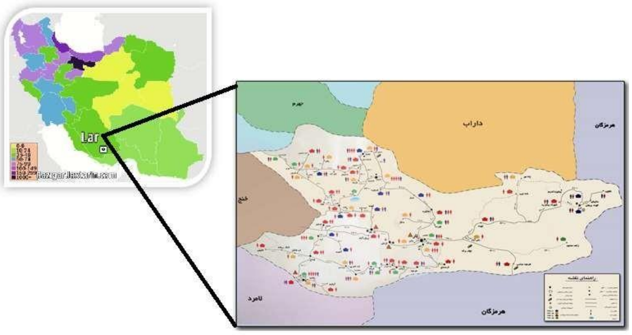

Figure. 1: geographical status of Larestan province (source: Research Collector)

From methodology point of view, this study was combined (descriptive qualitative) and was performed in two steps:

First step: in first step, a descriptive study was performed on 100 people of sample in order to identify and evaluate different levels of air pollution, comprehend on health risks, safety insight, safety performance, controlling actions, accurate working methods which data required was collected by field measurement methods and questionnaire[4]. Validity and reliability of questionnaire was estimated by experts and alpha was 0.72.

Second step: since the subject of research is to optimize occupational health risk due to air pollution in Fuzzy TOPSIS, thus, second step is on qualitative field, therefore, in second step (qualitative step) and after determining worker's status on health risk, safety insight, safety performance, controlling actions and accurate working status, 15 experts were selected by targeted method and structured by field interview method and completed checklist of multifaceted decision and at last, evaluated, prioritized and optimized by Fuzzy TOPSIS method.

Membership function of a trainable fuzzy number is offered as follows:

Fuzzy ranking is offered in **Table 1** for dependent variables

Weight (QA)	Option evaluation	Fuzzy numbers
Very slight	Very weak	(1,1,3)
Little	Weak	(1,3,5)
Much	Good	(3,5,7)
Very much	Very good	(7,9,9)

Table 1: fuzzy ranking for dependent variables.

Findings

Figure 2 shows effective factors on optimization of health risk which has four insights are safety insight, safety performance, risk comprehension and risk evaluation and subscales are determined for each of them on **Figure 2**.

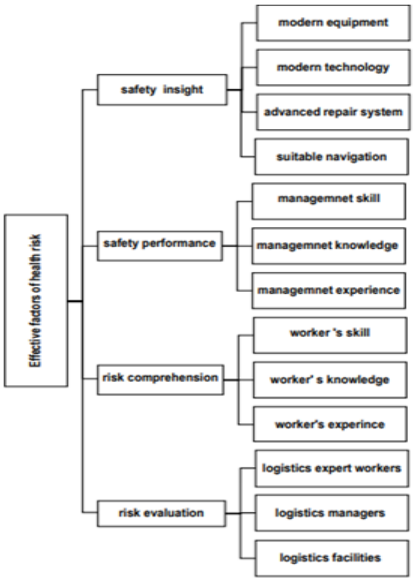

Figure 2: Network model to determine optimization factore for health risk

In another step, main weighting scales (was performed in terms of 9 quantitative hour scale) are determined which are on **Table 1** and the most weight is for risk comprehension and the lowest scale is safety insight.

Criteria	Risk comprehension	Safety performance	Risk evaluation	Safety insight	Normal
Risk comprehension	1				0.31
Safety performance	0.2	1			0.23
Risk evaluation	0.5	0.2	1		0.20
Safety insight	0.33	0.5	0.2	1	0.16

Table 2: pair comparison for main scales as for compatibility coefficient.

In another step, as for network structure, general super matrix structure or first matrix was recognized (Table 2). This matrix has 13 subscales which show specifications of main scales and selected for aims of study (Table 3).

Scales	Risk comprehension	Safetyperformance	Risk evaluation	Safety insight
Worker' skill	0	0	0	0.16
Worker; knowledge	0	0	0	0.30
Worker' experience	0	0	0	0.08
Management knowledge	0	0	0.47	0
Management experience	0	0	0.16	0
Manager' skill	0	0	0.09	0
Logistics expert workers	0	0.07	0	0
Logistics expert managers	0	0.28	0	0
Logistics expert facilities	0	0.19	0	0
Modern facilities	0.36	0	0	0
Modern technology	0.32	0	0	0
Modern repair system	0.10	0	0	0
Modern navigation	0.06	0	0	0

Table 3: shows pair comparison for internal dependency of matrix.

Stability test of variables

The first step in estimation is to discuss stability for variables. According to present study, by PP test, stability of variables was discussed which its results were on **Table 4**. As for results, null hypothesis is rejected in confidence level 99% as for unit root for safety insight, risk comprehension with and without time process [5]. Therefore, these variables are stable, but in risk evaluation, it is stable with width from destination and time process.

Variable	(to width from In level destination)	In level(with width from destination and time process)
Safety insight	*)0.00(-21.46	*)0.00(-21.55
Risk evaluation	)0.10(-2.54	) 0.00 (-4.78
Safety performance	)0.00(-6.01	)0.00(-6.43
Risk comprehension	)0.00(-5.05	)0.00(-6.78

Table 4: results of PP test for model variable.

Determine optimal pause for research Pattern

The first step in estimation of Fuzzy TOPSIS is to determine optimal pause for model variables. For each of variables, pause 8 is considered which the highest pause is optimal pause of variables [5]. According to it, for safety insight, safety performance and risk comprehension, two pauses and for risk evaluation, three pauses are considered as optimal pause.

Nonlinear test and select transport variable

After determining optimal pause for model variables, next step is to determine type of model in terms of F test in estimating of FUZZY TOPSIS which shall be determined in the event of rejection of null hypothesis on linear and nonlinear and transport variables and number of regimes for nonlinear model are determined in terms of F, F2, F3 and F4 test. Results of research are on **Table 4**. As for probable value of F test, null hypothesis is rejected for all variables instead of second pause for linear model and nonlinear hypothesis is accepted for all variables.

Transport variable	Probable value F	PROBABLE VALUE F4	Probable value F3	Probable value F2	Suggested model
Safety insight(t-1)	0.000	0.132	0.039	0.000	LFUZZY TOPSIS1
Safety insight(t-2)	0.425	0.913	0.4	0.038	Linear
Risk evaluation(t)*	0.000	0.041	0.000	0.000	LFUZZY TOPSIS2
Risk evaluation(t-1)	0.003	0.592	0.032	0.000	LFUZZY TOPSIS1
Risk evaluation(t-2)	0.371	0.653	0.927	0.01	Linear
Risk evaluation(t-3)	0.023	0.367	0.256	0.001	LFUZZY TOPSIS1
Safety performance (t)	0.021	0.039	0.164	0.0206	LFUZZY TOPSIS1
Safety performance(t-1)	0.01	0.369	0.003	0.122	LFUZZY TOPSIS2
TREND	0.000	0.043	0.000	0.005	LFUZZY TOPSIS2

Table 5: select type of model and transport variable.

In order to select suitable transport variable among other variables, each potential variable is tested but priority is on transport variable which is rejected its null hypothesis of F test. According to it, the most suitable transport variable is risk evaluation (t) in Table 5. Select suitable pattern to evaluate risk (t) as for F2, F3, F4 tests is another step in estimation of FUZZY TOPSIS model. As for the results in Table 5, suggested pattern for risk evaluation (t) is regression model for mild transport with logistic function LFUZZY TOPSIS2.

Estimation of Research Result

Model estimation consists of two steps. First step is to select first values for synchronic parameters variables y and threshold values C1, C2. Second step includes final estimation of pattern; first points for y, C1, C1 variables are ¼, 0.96 and 2.64 which was offered in another step. Using Newton Raphson pattern, parameters of estimation model and its results were on. It is worth to say that in linear and nonlinear sections, the variables which were not significant were deleted. According the results, majority of coefficients were significant in CI 99%. Another important point is that a for adjusted determination coefficient, its value was 97%. Final estimation value was 1.31 for synchronic parameter and it was 0.86 and 2.72 for threshold value of risk and shall be follows for transport function.

Discussion and Conclusion

The aim of optimization is to measure and control risks in terms of different indicators including scale of effect and probable event. Ranking of risks is regarded as key section. Because, risk ranking is a prioritization process and can be planned on devotion of resources [6]. In one side, the important action and recognize risk of each occupation and prioritize controlling actions. Health risk of building environments was evaluated by Fuzzy TOPSIS method. In order to determine effectiveness, LFUZZY TOPSIS was determined as optimal pattern, Gul et al., performed study on comparative map in health risk and occupational risk in terms of FTOPSIS which most important indicators for risk evaluation. According to results of LFUZZY TOPSIS, threshold value of risk evaluation was estimated at 0.86 and 2.72. As for estimated value, 1.31 is for synchronic transport parameter between regimes as smoothly, different variables coefficients are shown in different regimes which confirm effectiveness of variables on optimization of health risk. In evaluation risk lower than 0/86 and higher than 2.72, first pause for safety insight, safety performance, evaluation of current risk and first and third risk had negative effect [7]. Sum of safety insight in side effect and intermediate regimes was 0.77 and 0.12 which emphasize that negative effect. Sum of risk evaluation and pause values in side and intermediate regimes were 5.15 and 0.07 and shows that risk evaluation had positive and significant effect on health risk, so that in intermediate level, this effect is negative and insignificant.

Results study show that the most important risks were happened during construction and the risks are due to lacking access to safety belt, falling from panic height and lacking immediate response into emergency conditions [8]. The effect of safety performance was positive in three regimes and sum of the coefficients was 0.22 and in side regimes was 1.89 and it confirms that in high and low evaluation risk, safety performance has more effects than intermediate level on optimization of current health risk, As summary, as for the results we can say that risk evaluation has nonlinear effect on optimization of health risk and safety performance can be effective on risk comprehension and safety performance. In other side, speed of transport between regimes is mild and different effectiveness confirms that risk evaluation results to optimization of health risk but it is different during time as if it can be negative. Risk evaluation has different effect on optimization of health risk. According to theoretical basis, there is interaction between risk evaluation and safety insight on risk evaluation of country. The result confirms it too

References

1. Cho Jaelim, Choi YJ, Suh M, Sohn J, Kim H et al.(2014) Air pollution as a risk factor for depressive episode in patients with cardiovascular disease, diabetes mellitus, or asthma. J Affect Disord 157: 45-51.
2. Gul M, Guneri A, Baskan M (2018) An occupational risk assessment approach for construction and operation period of wind turbines. Glob J Environ Sci Manag 4: 281-298.
3. Gan Wen Q, Davies HW, Koehoorn M, Brauer Michael J (2012) Association of long-term exposure to community noise and traffic-related air pollution with coronary heart disease mortality. Am J Epidemiol 175: 898-906.
4. Bai N, Khazaei M, Stephan F van Eeden , Laher IJP (2007) The pharmacology of particulate matter air pollution-induced cardiovascular dysfunction. Pharmacol Ther 113: 16-29.
5. Haimes Yacov Y(2005) Risk modeling assessment and management. John Wiley & Sons
6. Pinto Abel, Nunes Isabel L, Rita AR (2011) Occupational risk assessment in construction industry - Overview and reflection. Saf Sci 49 : 616-624.
7. Kazemi Abolfazl, Aboutaleb S (2013) Presenting a multi-objective mathematical optimization model for classification in data mining. J Ind Eng Int 23: 485-501.
8. Mahdevari S, Shahriar K, Esfahanipour A (2014) Human health and safety risks management in underground coal mines using fuzzy TOPSIS. 488: 85-99.