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Assessment of Health Hazardous of Scavengers Using Intelligent System

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ABSTRACT

Most of the landfill are not practiced like as sanitary landfill rather solid wastes are dumping crudely without any policy or technique of the Municipal solid waste management authority. This indiscriminate disposal of wastes has led to significant degradation of environment, leading to contamination of environmental resources and spread of diseases, mainly among the scavengers and thus increasing the risk of exposure to highly contagious and transmission prone disease vectors. Scavengers are surviving based on the recyclable waste found in the disposal place. Thus cases of suffering from various diseases is a common feature of them. But there is no tool available at present to an authority or to an expert to assess the health hazardous of scavengers more exactly or precisely. This is a great problem today to a Govt. and this proposed system can help to a planner or decision maker in the process of assessment of health hazardous with degree of certainty. We use an intuitionistic fuzzy logic for such evaluation.

Keywords: EIA, intuitionistic fuzzy set, mean fuzzy set.

INTRODUCTION

In most of the states of world, the sanitary land fill is not practiced rather the carrying vehicles unloaded the wastes here & there in the dumping place daily where they felt suitable best [3]. The waste which are finally lying at site are almost decomposable materials. Because most of the recyclable materials are picked up by the scavengers either from the source or from landfill site. Thus there are potential risks to health of scavengers and also to the environment for improper handling of waste by the scavengers regularly in disposal site. Most of them are suffering mainly from "gastroenteritis", "asthma" , "bronchitis" , "skin diseases" etc which are not identified ever by the management because of lack of infrastructure or proper tool to them. This work can give a beam of light to assess the adverse environmental impact to the health of scavengers. In EIA usually the public views and comments are taken an important data for evaluation. General public attitude in a major project is often expressed as concern about the existence of unknown or unforeseen effect. Involvement of public in scooping in many situations, is helpful because EIA is a predictive exercise. The model is taken up in this exercise as a rapid assessment technique for determining the current status of environmental impact to the health of scavengers. Project data and the data on the existing environmental conditions are known as baseline data. In the next section we justify the necessity of intuitionistic fuzzy set theory in EIA.

WHY INTUITIONISTIC FUZZY TECHNIQUE IS TO BE ADOPTED?

In EIA, general public views and observation are collected as an important information. But the data so obtained are not always crisp or precise. Most of the data are not numeric, rather linguistic viz. "good", "very good", "poor", "not less than 60%", "not so effected", " approximately 20%" , etc. to list a few only out of infinity. Such type of imprecise data are fuzzy data [1] or intuitionistic fuzzy data [9]. Evaluation of many objects here is not always possible with numerical valued descriptions. Besides, such type of evaluation is often associated with unavoidable hesitation. Some part of the evaluation contribute to truthness, some part to falseness and the rest part remain indeterministic. It is not possible always for a decision-maker or intelligent agent, to make a good evaluation about each and every object under consideration to guess a membership value. It is has an element of hesitation

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in his mind. He can better guess a degree of belongingness and a degree of non-belongingness independently and with much more confidence, and thus the rest amount remains unevaluated (indeterministic). Consequently it is ideal to adopt a proper mathematical tool to do a proper judgment or evaluation. Certainly intuitionistic fuzzy mathematics is a suitable one for this purpose. Some basic preliminaries on IFS are presented in our next section.

PRELIMINARIES

In this section we present some preliminaries which will be useful to our work in the next section

Fuzzy Set Theory

Let E be a non null set called the universe. A fuzzy set A of E is characterized by the mapping

$E \rightarrow [\,0, 1\,]$.

For an object x in E, the degree of belongingness of x in the fuzzy set A is defined by the amount $\mu_A(x)$, where $0 \leq \mu_A(x) \leq 1$. The rest amount $1-\mu_A(x)$ denotes the degree of non-belongingness.

Intuitionistic Fuzzy Theory[1]

Let E be a fixed universe: An intuitionistic fuzzy set or IFS A in E is an object having in the form

$A = \{ < x, \mu_A(x), \nu_A(x) > \mid x \in E \}$

where the functions $\mu_A : E \rightarrow [0, 1]$ and $\nu_A : E \rightarrow [0, 1]$ define respectively the 'membership function' and the 'non-membership function'. The value $\mu(x)$ indicates the degree of membership and the value $\nu(x)$ indicates the degree of non-membership of the element $x \in E$ to the set A, and $\forall\, x \in E$, $0 \leq \mu_A(x) + \nu_A(x) \leq 1$.

METHODOLOGY FOR "INTUITIONISTIC FUZZY EIA"

In this section we present our proposal for intuitionistic fuzzy EIA. First of all we present some definitions required to explain our methodology..

Definition 4.1 Attributes of the Assessment

The assessment is done by collecting information or values for certain attributes which are called the attributes of the assessment. For example, consider a project of " ENVIRONMENTAL IMPACT ASSESSMENT OF THE HEALTH OF SCAVENGERS" , for which some relevant attributes could be "bad habit of taking food in landfill site ", " bad habit to stay nearby landfill site ", " bad habit of open defecation " , " bad quality of recyclable wastes " , etc.

Definition 4.2 Universe of the Assessment

Collection of all attributes of the assessment is called the Universe of the Assessment.

Definition 4.3 Mean Fuzzy Set of an IFS

Let E be an universe and X be an IFS of E. The mean fuzzy set of the IFS X is a fuzzy set m of E given by the membership function

$$m(x) = \frac{\mu_A(x) + 1 - \nu(x)}{2}$$

Definition 4.4 Weighted Average of an IFS

Let A be an IFS of a finite set X, and let μ be its mean fuzzy set. Suppose that to each element $x \in X$, there is an associated weight $W_x \in R+$ (set of all non-negative real numbers). Then the weighted average of the IFS A is the non-negative number a(A) given by

$$a(A) = \frac{\sum m(x) \,.\, W_x}{\sum W_x}$$

Definition 4.5 Grading of Assessment Output

Depending upon the value of a (A), the grading of overall output could be temporarily proposed as below:

grade = **A**, if **.**8 < a (A) ≤ 1

grade = **B**, if **.**6 < a (A) ≤ **.**8

grade = **C**, if **.**4 < a (A) ≤ **.**6

grade = **D**, if **.**2 < a (A) ≤ **.**4

grade = **E**, if 0 ≤ a (A) ≤ **.**2

where certainly grade "E" is the best and grade "A" is the worst condition. In the next part we present the methodology of intuitionistic fuzzy assessment by a hypothetical case study.

CASE STUDY

The project is "ENVIRONMENTAL IMPACT ASSESSMENT OF THE HEALTH OF SCAVENGERS (DRAWBACK)". To do the assessment let us consider the following attributes (for the sake of simplicity in presenting the method, we consider here only ten attributes, with no loss of generality):-

x_1 = bad habit of taking food in landfill site

x_2 = bad habit of staying nearby landfill at night

x_3 = bad habit of non-using gloves & gumboots

x_4 = unusual number of mosquito breeding

x_5 = unusual number of fly breeding

x_6 = ill condition of health

x_7 = bad condition of premises of disposal site

x_8 = bad drinking water facility in disposal site

x_9 = bad habit of open defecation in the site

x_{10} = bad quality of recyclable wastes

Now the job is to assign the values of these attributes. This can be done either by direct observation or by collecting views from a good number of scavengers or inhabitants nearby the disposal site in addition to the administrative person of the disposal site.

For instance, let us suppose that the data collected from 100 people for an attribute x_i reveals that more or less 70 people are in support of the truthness of the attribute, 20 are in support of falseness and the rest 10 people are without any comment due to hesitation. In this case we will set the following for our intuitionistic fuzzy analysis :-

$\mu_A(x_i)$ = **.**7 and $\nu(x_i)$ = **.**2, and thus the indeterministic-part = .1.

In this way, suppose the data (hypothetical) as collected are shown below:

Attribute name	in support of truthness μ(x)	in support of falseness ν(x)	indeterministic part	weight of the attribute W_x
x_1	.7	.1	.2	50
x_2	.8	.1	.1	70
x_3	.5	.5	0	30
x_4	.5	.2	.3	25
x_5	.6	.1	.3	30
x_6	.7	.1	.2	60
x_7	.8	.1	.1	15
x_8	.4	.3	.3	40
x_9	.9	.1	0	35
x_{10}	.6	.2	.2	20

\These data leads to an IFS X of the universe E where

E = { x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10} }.

Now calculate the mean fuzzy set m of the IFS X. We find that

m = {(x_1,0.8), (x_2,0.85), (x_3,0.5), (x_4,0.65), (x_5,0.75),(x_6,0.8), (x_7,0.85), (x_8,0.55), (x_9,0.9), (x_{10},0.7)}.

Therefore we calculate that the weighted average of this fuzzy set m is **0.750** , and consequently the grade to be awarded is "**B"**. Thus the assessment reveals that the health of scavengers are not with good position and necessary precaution is needed to mitigate the adverse impact of waste to the health of scavengers.

CONCLUSION

In the procedure of EIA uncertainty is the integral part. In present paper we see that intuitionistic fuzzy logic can be suitably applied to assess the health impact of scavengers who are working in the disposal site. Because the data or information so obtained from the landfill area are not always crisp or precise rather fuzzy in nature involving uncertainties and vagueness. Thus the integrated result of impact is not in numerical form rather in linguistic. Thus the intuitionistic fuzzy logic will be the best tools to deals with this type of uncertainties involves in the procedure of assessment. However, the overall assessment or summarization of the environmental impact should only serve as one of the parameters just or criteria to the decision makers. There could be other parameters hidden or not hidden such as local politics, local constraints, etc which will influence the decision makers of the project.

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