Approach to environmental environmental issues

D. T. Muhamediyeva[1*]

[1]"Tashkent Institute of Irrigation and Agricultural Mechanization Engineers" National Research University, 39, Kori Niyoziy Street, Tashkent, 100000, Uzbekistan

Abstract. Z-numbers have been used to address environmental monitoring issues. A computational experiment based on a combination of odd and even numbers was also performed and their comparative analysis was considered. Results of experimental research using Z-assessment in obscure conclusion systems have been applied, and this approach has been used to address environmental monitoring issues in the case of a poorly formed process.

1 Introduction

At present, it is necessary to conduct regular environmental monitoring, taking into account the changing nature as a result of the intensification of various negative impacts on nature. Environmental monitoring can be carried out for a variety of purposes, including, for example, the study of groundwater status, soil conditions and the impact of crops on the environment, the suitability of the area for agricultural activities, and so on. The solution of the problems that may arise in these cases requires, first of all, modern information and communication technologies (based on the processing and approach to large volumes and different types of data). [1-4].

World experience shows that a number of scientific studies have been conducted to improve the health of the population and its indicators through environmental monitoring: continuous monitoring of natural disasters and climate change forecasting (Japan) [1] ; research is being conducted to measure the state of air pollution and develop measures to improve the environmental performance, network monitoring of urban ecosystems (Republic of China) [2-4]; A number of measures have been taken to prioritize environmental problems at facilities, process environmental data and create an information-analytical center with a single database.

Scientists working in various fields around the world use modern information technologies to study water conditions, continuous soil conditions, weather conditions, the dynamics of groundwater resources and other important factors, including geoinformation technologies, remote sensing, data from sensors. A number of studies are underway to study the impact of environmental change on nature using IoT (Internet of Things) and similar technologies [5-8].

* Corresponding author: sapaevibrokhim@gmail.com

2 Approaches to solving environmental monitoring problems

In assessing the state of poorly formed processes, it is possible to come across existing classical mathematical methods, as well as data that are valuable, incomplete, ambiguous and ambiguous in cases where it is difficult to classify them. In such cases, it is very difficult to obtain accurate information [9, 10]. Data of an ambiguous, ambiguous nature required to build a system of evaluation and prediction in solving practical problems in conditions of uncertainty can be divided into two parts: quantitative and linguistic. Most obscure systems use the second type of knowledge, as well as obscure data, which is expressed in the form of an implicit rule base that is integrated into the implicit conclusion systems [10 - 14].

$Z_1 = (A_1, B_1)$, $Z_2 = (A_2, B_2)$. T-norma $Z_{T-norm}(Z_1, Z_2)$ is defined [9, 10]:

$$Z_{T-norm}(Z_1, Z_2) = T((A_1, B_1), (A_2, B_2)) = (T(A_1, A_2), T(B_1, B_2)) \quad (1)$$

$$Z^{+}_{T-norm}(Z_1, Z_2) = (T(A_1, A_2), T(R_1, R_2)).$$

Here

$$T(A_1, A_2) = \bigcup_{\alpha \in (0,1]} T(A_1^{\alpha}, A_2^{\alpha}); T(A_1^{\alpha}, A_2^{\alpha}) = \{T(x, y) \big| x \in A_1^{\alpha}, y \in A_2^{\alpha}\},$$

$$T(R_1, R_2) = R_1 \wedge R_2.$$

T-conorma $Z_{T-conorm}(Z_1, Z_2)$ is defined [9, 10]:

$$Z_{T-conorm}(Z_1, Z_2) = S((A_1, B_1), (A_2, B_2)) = (S(A_1, A_2), S(B_1, B_2)), \quad (2)$$

$$Z^{+}_{T-conorm}(Z_1, Z_2) = (S(A_1, A_2), S(R_1, R_2)),$$

Here

$$S(A_1, A_2) = \bigcup_{\alpha \in (0,1]} S(A_1^{\alpha}, A_2^{\alpha}); S(A_1^{\alpha}, A_2^{\alpha}) = \{S(x, y) \big| x \in A_1^{\alpha}, y \in A_2^{\alpha}\},$$

$$S(R_1, R_2) = R_1 \vee R_2.$$

According to (1) [9]:

$$Z_{H_i G_i} = Z_{T-norm}(Z_{H_i}, Z_{G_i}) = T((A_{H_i}, B_{H_i}), (A_{G_i}, B_{G_i})).$$

According to (2) [9]:

$$Z_{agg} = Z_{T-conorm}(Z_{g_1h_1}, Z_{g_2h_2}, ..., Z_{g_nh_n}) = S((A_{g_1h_1}, B_{g_1h_1}), (A_{g_2h_2}, B_{g_2h_2}), ..., (A_{g_nh_n}, B_{g_nh_n}))$$

.

Situational decision-making algorithm for ecologically problematic areas has been applied on the basis of data obtained from observation points, and human living conditions in problem areas should be based on a comprehensive analysis of water, soil and environmental conditions in these areas. [15].

3 Computational experiment

Depending on the situation in the area, we can identify the following issues that affect environmental monitoring[16-19]:

g_1 - disturbance of land reclamation;

g_2 - pollution of groundwater resources;

g_3 - environmental problem.

In the origin of these problems (situations), a number of parameters of environmental water, air, soil conditions play an important role, the main of which we will describe below.

h_1 - rising groundwater (h);

h_2 - rising groundwater (v);

h_3 rising groundwater (ch);

h_4 - rising groundwater (cv).

Experimental characteristics of environmental water, air, soil conditions $H = \{h_1, h_2, ..., h_4\}$ based on the origin of these situations $G = \{g_1, g_2, g_3, g_4\}$),, was held for selection purposes.

Estimated assessment of the environmental situation $p = \int_R \mu_A(u) p_x(u) du$ determined on the basis of the T-norm operation described in the formula. Let us first consider the calculation of the approximate cost for the environmental situation.

For each$x$ calculated $p_{A_{h_1}}(x)$:

at $b_1 = 0.1$

$$p_{h_1} = 0/0 + 0/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0/6 + 0/7 + 0/8 + 0/9,$$

$$p_{g_1} = 0/0 + 0.8/1 + 0/2 + 0.2/3 + 0/4 + 0/5 + 0/6 + 0/7 + 0/8 + 0/9,$$

$$p_{hg_1} = 0/0 + 0/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0/6 + 0/7 + 0/8 + 0/9.$$

$$\sum_{k=0}^{9} \mu_{A_{h_1}}(x_{h_1,k}) \cdot p_{A_{h_1}}(x_{h_1,k}) = 0.2 \cdot 0 + 0.4 \cdot 0 + 1 \cdot 0 + 0.4 \cdot 0 +$$
$$+0.2 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 = 0,$$

$$\sum_{k=0}^{9}\mu_{A_{g_1}}(x_{g_1,k})\cdot p_{A_{g_1}}(x_{g_1,k}) = 0\cdot 0 + 0.6\cdot 0.8 + 0.8\cdot 0 + 1\cdot 0 + 0.7\cdot 0 +$$
$$+0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.48.$$

$$b_{A_{h_1g_1}} = P(A_{h_1g_1}) = \sum_{k=0}^{9}\mu_{A_{h_1g_1}}(\mathrm{y}_{y_i})\cdot p_{A_{h_1g_1}}(\mathrm{y}_i) = 0.2\cdot 0 + 0.6\cdot 0 + 1\cdot 0 + 0.4\cdot 0 + 0.2\cdot 0 +$$
$$+0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0,$$

at $b_1 = 0.2$

$$p_{h_1} = \frac{0}{0} + \frac{0.97}{1} + \frac{0}{2} + \frac{0.01}{3} + \frac{0}{4} + \frac{0}{5} + \frac{0}{6} + \frac{0}{7} + \frac{0}{8} + \frac{0.02}{9},$$

$$p_{g_1} = \frac{0}{0} + \frac{1}{1} + \frac{0}{2} + \frac{0}{3} + \frac{0}{4} + \frac{0}{5} + \frac{0}{6} + \frac{0}{7} + \frac{0}{8} + \frac{0}{9},$$

$$p_{hg_1} = \frac{0}{0} + \frac{0.99}{1} + \frac{0}{2} + \frac{0}{3} + \frac{0}{4} + \frac{0}{5} + \frac{0}{6} + \frac{0}{7} + \frac{0}{8} + \frac{0}{9}.$$

$$\sum_{k=0}^{9}\mu_{A_{h_1}}(x_{h_1,k})\cdot p_{A_{h_1}}(x_{h_1,k}) = 0.2\cdot 0 + 0.4\cdot 0.97 + 1\cdot 0 + 0.4\cdot 0 +$$
$$+0.2\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.388,$$

$$\sum_{k=0}^{9}\mu_{A_{g_1}}(x_{g_1,k})\cdot p_{A_{g_1}}(x_{g_1,k}) = 0\cdot 0 + 0.6\cdot 1 + 0.8\cdot 0 + 1\cdot 0 +$$
$$+0.4\cdot 0 + 0.2\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.6.$$

$$b_{A_{h_1g_1}} = P(A_{h_1g_1}) = \sum_{k=0}^{9}\mu_{A_{h_1g_1}}(\mathrm{y}_{y_i})\cdot p_{A_{h_1g_1}}(\mathrm{y}_i) = 0.2\cdot 0 + 0.6\cdot 0.97 + 1\cdot 0 + 0.4\cdot 0 + 0.2\cdot 0 +$$
$$+0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.582,$$

at $b_1 = 0.3$

$$p_{h_1} = \frac{0}{0} + \frac{0.98}{1} + \frac{0}{2} + \frac{0.02}{3} + \frac{0}{4} + \frac{0}{5} + \frac{0}{6} + \frac{0}{7} + \frac{0}{8} + \frac{0}{9},$$

$$p_{g_1} = \frac{0}{0} + \frac{0.92}{1} + \frac{0}{2} + \frac{0.08}{3} + \frac{0}{4} + \frac{0}{5} + \frac{0}{6} + \frac{0}{7} + \frac{0}{8} + \frac{0}{9},$$

$$\sum_{k=0}^{9}\mu_{A_{h_1}}(x_{h_1,k})\cdot p_{A_{h_1}}(x_{h_1,k}) = 0.2\cdot 0 + 0.4\cdot 0.98 + 1\cdot 0 + 0.4\cdot 0.02 +$$
$$+0.2\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.392\cdot 0.08 = 0.4,$$

$$\sum_{k=0}^{9}\mu_{A_{g_1}}(x_{g_1,k})\cdot p_{A_{g_1}}(x_{g_1,k}) = 0\cdot 0 + 0.6\cdot 0.99 + 0.8\cdot 0 + 1\cdot 0.08 +$$
$$+0.4\cdot 0 + 0.2\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.594\cdot 0.08 = 0.674.$$

$$b_{A_{h_1g_1}} = P(A_{h_1g_1}) = \sum_{k=0}^{9}\mu_{A_{h_1g_1}}(\mathrm{y}_{y_i})\cdot p_{A_{h_1g_1}}(\mathrm{y}_i) = 0.2\cdot 0 + 0.6\cdot 0.99 + 1\cdot 0 + 0.4\cdot 0.01 + 0.2\cdot 0 +$$
$$+0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.594\cdot 0.004 = 0.598.$$

Thus, calculations were performed for each situation, and calculations for the second situation were performed below.

$$A_{h_2} = 0/1 + 0.3/1 + 0.4/2 + 0.7/3 + 1/4 + 0.8/5 + 0.6/6 + 0/7 + 0/8 + 0/9,$$

$$A_{g_2} = 0/0 + 0/1 + 0.4/2 + 0.6/3 + 1/4 + 0.8/5 + 0/6 + 0/7 + 0/8 + 0/9.$$

First stage

$$A_{h_2g_2} = 0/0 + 0.3/1 + 0.4/2 + 0.7/3 + 1/4 + 0.8/5 + 0/6 + 0/7 + 0/8 + 0/9.$$

For each x calculated $p_{A_{h_2}}(x)$:

at $b_1 = 0.1$

$$p_{h_2} = 0/0 + 0.7/1 + 0/2 + 0/3 + 0/4 + 0.1/5 + 0/6 + 0/7 + 0/8 + 0.2/9,$$

$$p_{g_2} = 0/0 + 0.44/1 + 0/2 + 0/3 + 0/4 + 0.1/5 + 0/6 + 0/7 + 0/8 + 0.46/9,$$

$$p_{hg_2} = 0/0 + 0.832/1 + 0/2 + 0/3 + 0/4 + 0.076/5 + 0/6 + 0/7 + 0/8 + 0/9.$$

$$\sum_{k=0}^{9}\mu_{A_{h_2}}(x_{h_2,k})\cdot p_{A_{h_2}}(x_{h_3,k}) = 0\cdot 0 + 0.3\cdot 0.7 + 0.4\cdot 0 + 0.7\cdot 0 +$$
$$+1\cdot 0 + 0.8\cdot 0.1 + 0.6\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0.2 = 0.21\cdot 0.08 = 0.29,$$

$$\sum_{k=0}^{9}\mu_{A_{g_2}}(x_{g_2,k})\cdot p_{A_{g_2}}(x_{g_2,k}) = 0\cdot 0+0\cdot 0.44+0.4\cdot 0+0.6\cdot 0+1\cdot 0+$$
$$+0.8\cdot 0.1+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0.46=0.$$

$$b_{A_{h2g2}} = P(A_{h_2g_2}) = \sum_{k=0}^{9}\mu_{A_{h2g2}}(\mathrm{y}_{y_i})\cdot p_{A_{h2g2}}(\mathrm{y}_i) = 0\cdot 0+0.3\cdot 0.832+0.4\cdot 0+0.7\cdot 0+1\cdot 0+$$
$$+0.8\cdot 0.076+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0=0.3104,$$

at $b_1 = 0.2$

$$p_{h_2} = \frac{0}{0}+\frac{0.76}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.2}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0.04}{9},$$

$$p_{g_2} = \frac{0}{0}+\frac{0.5}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.2}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0.3}{9},$$

$$p_{hg_2} = \frac{0}{0}+\frac{0.9}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.072}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0.012}{9}.$$

$$\sum_{k=0}^{9}\mu_{A_{h_2}}(x_{h_2,k})\cdot p_{A_{h_2}}(x_{h_3,k}) = 0\cdot 0+0.3\cdot 0.76+0.4\cdot 0+0.7\cdot 0+$$
$$+1\cdot 0+0.8\cdot 0.1+0.6\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0.2=0.228\cdot 0.08=0.308,$$

$$\sum_{k=0}^{9}\mu_{A_{g_2}}(x_{g_2,k})\cdot p_{A_{g_2}}(x_{g_2,k}) = 0\cdot 0+0\cdot 0.5+0.4\cdot 0+0.6\cdot 0+1\cdot 0+$$
$$+0.8\cdot 0.2+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0.3=0.16.$$

$$b_{A_{h2g2}} = P(A_{h_2g_2}) = \sum_{k=0}^{9}\mu_{A_{h2g2}}(\mathrm{y}_{y_i})\cdot p_{A_{h2g2}}(\mathrm{y}_l) = 0\cdot 0+0.3\cdot 0.9+0.4\cdot 0+0.7\cdot 0+1\cdot 0+$$
$$+0.8\cdot 0.072+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0.012=0.27\cdot 0.0576=0.327,$$

at $b_1 = 0.3$

$$p_{h_2} = \frac{0}{0}+\frac{0.77}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.23}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0}{9},$$

$$p_{g_2} = \frac{0}{0}+\frac{0.56}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.3}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0.14}{9},$$

$$p_{hg_2} = \frac{0}{0}+\frac{0.897}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0.101}{5}+\frac{0}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0}{9}.$$

$$\sum_{k=0}^{9}\mu_{A_{h_2}}(x_{h_2,k})\cdot p_{A_{h_2}}(x_{h_3,k}) = 0\cdot 0 + 0.3\cdot 0.77 + 0.4\cdot 0 + 0.7\cdot 0 +$$
$$+1\cdot 0 + 0.8\cdot 0.23 + 0.6\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.231\cdot 0.184 = 0.415,$$

$$\sum_{k=0}^{9}\mu_{A_{g_2}}(x_{g_2,k})\cdot p_{A_{g_2}}(x_{g_2,k}) = 0\cdot 0 + 0\cdot 0.56 + 0.4\cdot 0 + 0.6\cdot 0 + 1\cdot 0 +$$
$$+0.8\cdot 0.3 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0.14 = 0.24.$$

$$b_{A_{h_2g_2}} = P(A_{h_2g_2}) = \sum_{k=0}^{9}\mu_{A_{h_2g_2}}(\mathrm{y}_{y_i})\cdot p_{A_{h_2g_2}}(\mathrm{y}_i) = 0\cdot 0 + 0.3\cdot 0.897 + 0.4\cdot 0 + 0.7\cdot 0 + 1\cdot 0 +$$
$$+0.8\cdot 0.101 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.24\cdot 0.080 = 0.320,$$

Results of the calculations performed for the third situation:

$$A_{h_3} = 0/0 + 0/1 + 0.5/2 + 0.6/3 + 0.7/4 + 1/5 + 0.7/6 + 0/7 + 0/8 + 0/9,$$

$$A_{g_3} = 0/0 + 0/1 + 0/2 + 0.4/3 + 0.6/4 + 1/5 + 0.8/6 + 0/7 + 0/8 + 0/9.$$

First stage.

$$A_{h_3g_3} = 0/0 + 0/1 + 0.5/2 + 0.6/3 + 0.7/4 + 0.8/5 + 0.7/6 + 0/7 + 0/8 + 0/9.$$

at $b_1 = 0.1$

$$p_{h_3} = 0/0 + 0.73/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.1/6 + 0/7 + 0/8 + 0.17/9,$$

$$p_{g_3} = 0/0 + 0.48/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.1/6 + 0/7 + 0/8 + 0.42/9,$$

$$p_{h_3g_3} = 0/0 + 0.85/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.06/6 + 0/7 + 0/8 + 0.07/9.$$

$$\sum_{k=0}^{9}\mu_{A_{h_3}}(x_{h_3,k})\cdot p_{A_{h_3}}(x_{h_3,k}) = 0\cdot 0 + 0\cdot 0.73 + 0.5\cdot 0 + 0.6\cdot 0 +$$
$$+0.7\cdot 0 + 1\cdot 0 + 0.7\cdot 0.1 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0 = 0.07,$$

$$\sum_{k=0}^{9}\mu_{A_{g_3}}(x_{g_3,k})\cdot p_{A_{g_3}}(x_{g_3,k}) = 0\cdot 0 + 0\cdot 0.85 + 0\cdot 0 + 0.4\cdot 0 + 0.6\cdot 0 +$$
$$+1\cdot 0 + 0.8\cdot 0.06 + 0\cdot 0 + 0\cdot 0 + 0\cdot 0.07 = 0.048.$$

$$b_{A_{h3g3}} = P(A_{h_3g_3}) = \sum_{k=0}^{9} \mu_{A_{h3g3}}(\mathrm{y}_{y_i}) \cdot p_{A_{h3g3}}(\mathrm{y}_i) = 0 \cdot 0 + 0 \cdot 0.85 + 0.5 \cdot 0 + 0.6 \cdot 0 + 0.7 \cdot 0 + 0.8 \cdot 0 +$$
$$+0.7 \cdot 0.06 + 0 \cdot 0 + 0 \cdot 0 = 0.042,$$

at $b_1 = 0.2$

$$p_{h_3} = 0/0 + 0.8/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.2/6 + 0/7 + 0/8 + 0/9,$$

$$p_{g_3} = 0/0 + 0.55/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.2/6 + 0/7 + 0/8 + 0.25/9,$$

$$p_{hg_3} = 0/0 + 0.91/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.09/6 + 0/7 + 0/8 + 0/9.$$

$$\sum_{k=0}^{9} \mu_{A_{h_3}}(x_{h_3,k}) \cdot p_{A_{h_3}}(x_{h_3,k}) = 0 \cdot 0 + 0 \cdot 0.73 + 0.5 \cdot 0 + 0.6 \cdot 0 +$$
$$+0.7 \cdot 0 + 1 \cdot 0 + 0.7 \cdot 0.1 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 = 0.07,$$

$$\sum_{k=0}^{9} \mu_{A_{g_3}}(x_{g_3,k}) \cdot p_{A_{g_3}}(x_{g_3,k}) = 0 \cdot 0 + 0 \cdot 0.85 + 0 \cdot 0 + 0.4 \cdot 0 + 0.6 \cdot 0 +$$
$$+1 \cdot 0 + 0.8 \cdot 0.06 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0.07 = 0.048.$$

$$b_{A_{h3g3}} = P(A_{h_3g_3}) = \sum_{k=0}^{9} \mu_{A_{h3g3}}(\mathrm{y}_{y_i}) \cdot p_{A_{h3g3}}(\mathrm{y}_i) = 0 \cdot 0 + 0 \cdot 0.85 + 0.5 \cdot 0 + 0.6 \cdot 0 + 0.7 \cdot 0 + 0.8 \cdot 0.2 +$$
$$+0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 = 0.16.$$

At $b_1 = 0.3$

$$p_{h_3} = 0/0 + 0.8/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.2/6 + 0/7 + 0/8 + 0/9,$$

$$p_{g_3} = 0/0 + 0.63/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.3/6 + 0/7 + 0/8 + 0.07/9,$$

$$p_{hg_3} = 0/0 + 0.91/1 + 0/2 + 0/3 + 0/4 + 0/5 + 0.09/6 + 0/7 + 0/8 + 0/9.$$

$$\sum_{k=0}^{9} \mu_{A_{h_3}}(x_{h_3,k}) \cdot p_{A_{h_3}}(x_{h_3,k}) = 0 \cdot 0 + 0 \cdot 0.73 + 0.5 \cdot 0 + 0.6 \cdot 0 +$$
$$+0.7 \cdot 0 + 1 \cdot 0 + 0.7 \cdot 0.1 + 0 \cdot 0 + 0 \cdot 0 + 0 \cdot 0 = 0.07,$$

$$\sum_{k=0}^{9}\mu_{A_{g_3}}(x_{g_3,k})\cdot p_{A_{g_3}}(x_{g_3,k}) = 0\cdot 0+0\cdot 0.85+0\cdot 0+0.4\cdot 0+0.6\cdot 0+$$
$$+1\cdot 0+0.8\cdot 0.06+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0.07 = 0.048,$$

$$b_{A_{h_3g_3}} = P(A_{h_3g_3}) = \sum_{k=0}^{9}\mu_{A_{h_3g_3}}(\mathrm{y}_{y_i})\cdot p_{A_{h_3g_3}}(\mathrm{y}_i) = 0\cdot 0+0\cdot 0.85+0.5\cdot 0+0.6\cdot 0+0.7\cdot 0+0.8\cdot 0.2+$$
$$+0\cdot 0+0\cdot 0+0\cdot 0 = 0.16,$$

At $b_1 = 0.4$

$$p_{h_3} = \frac{0}{0}+\frac{0.66}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0}{5}+\frac{0.34}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0}{9},$$

$$p_{g_3} = \frac{0}{0}+\frac{0.55}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0}{5}+\frac{0.34}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0.07}{9},$$

$$p_{h_3g_3} = \frac{0}{0}+\frac{0.774}{1}+\frac{0}{2}+\frac{0}{3}+\frac{0}{4}+\frac{0}{5}+\frac{0.115}{6}+\frac{0}{7}+\frac{0}{8}+\frac{0}{9}.$$

$$\sum_{k=0}^{9}\mu_{A_{h_3}}(x_{h_3,k})\cdot p_{A_{h_3}}(x_{h_3,k}) = 0\cdot 0+0\cdot 0.66+0.55\cdot 0+0.6\cdot 0+$$
$$+0.7\cdot 0+1\cdot 0+0.7\cdot 0.34+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0 = 0.238,$$

$$\sum_{k=0}^{9}\mu_{A_{g_3}}(x_{g_3,k})\cdot p_{A_{g_3}}(x_{g_3,k}) = 0\cdot 0+0\cdot 0.55+0\cdot 0+0.4\cdot 0+0.6\cdot 0+$$
$$+1\cdot 0+0.8\cdot 0.34+0\cdot 0+0\cdot 0+0\cdot 0+0\cdot 0 = 0.272,$$

$$b_{A_{h_3g_3}} = P(A_{h_3g_3}) = \sum_{k=0}^{9}\mu_{A_{h_3g_3}}(\mathrm{y}_{y_i})\cdot p_{A_{h_3g_3}}(\mathrm{y}_i) = 0\cdot 0+0\cdot 0.77+0.2\cdot 0+0.6\cdot 0+0.7\cdot 0+0.8\cdot 0+$$
$$+0.7\cdot 0.115+0\cdot 0+0\cdot 0 = 0.08,$$

T-conor to obtain the final final grade calculated as $Z_{T-conorm}(Z_{12}, Z_{HG_3}) = S(Z_{12}, Z_{HG_3}) = (A, B)$:

$$A = \frac{0}{0}+\frac{0}{1}+\frac{0.5}{2}+\frac{0.6}{3}+\frac{0.7}{4}+\frac{1}{5}+\frac{0.7}{6}+\frac{0}{0}+\frac{0}{0}+\frac{0}{0},$$

$$B = \frac{0}{0.61}+\frac{0}{0.64}+\frac{0}{0.67}+\frac{0}{0.70}+\frac{0}{0.73}+\frac{0.01}{0.76}+\frac{0.14}{0.78}+$$
$$+\frac{0.61}{0.82}+\frac{1}{0.85}+\frac{0.6}{0.91}.$$

The value of situations as a result b (S1) >b (S3) >b (S2) this includes the development of preventive measures to improve the reclamation of lands.

4 Conclusion

Thus, when conducting environmental monitoring of problem areas, the current situation was initially formed on the basis of data collected in the region. The data of the numerical or spatial image of the region are used to formulate the current situation, the situation in the whole region is determined. As the number of monitoring parameters in the region increases, so does the number of current situations. Given the complexity of the current situations, they were converted into typical situations and the diagnostic problem was solved based on the knowledge base and Z-numbers.

References

1. Shibasaki R and Song X 2017 DeepMob: Learning Deep Knowledge of Human Emergency Behavior and Mobility from Big and Heterogeneous Data ACM Transactions on Information Systems(USA) **V** 35(4) pp 1-19
2. Liu SQ, Li JG, Mei M and Dong DL 2007 Underground waterpollution from underground coal gasification Journal of China University of Mining and Technology (China) **V** 17 pp 467–472
3. Dong RC, Tang MF, Zhou K, Li SY and Wu G 2013 Study on the modified quadrat sampling method for urban ecosystem network monitoring Int J Sust Dev World Ecol (USA) pp 210–215
4. Fan YH, Lu ZH, Cheng JL, Zhou ZX and Wu G 2003 Major ecological and enviromental problems and the ecological reconstruction technologies of the coal mining areas in China Acta Ecol Sinica (China) **V** 23(10) pp 2144–2152
5. Athani S and Tejeshwar C H 2017 Soil moisture monitoring using IoT enabled Arduino sensors with neural networks for improving soil management for farmers and predict seasonal rainfall for planning future harvest in North Karnataka – India. International conference on i-smac, Palladam, India, pp 43-48
6. Mari C D 2012 An overview of the internet of underwater things Journal of Network and Computer Applications, **V** 35(6) pp 1879-1890
7. Zadeh L A 2011 A note on a Z-number Information Sciences 181, USA, pp 2923-2932
8. Zadeh L A 2012 Methods and systems for applications with Z-numbers United States Patent (US 8,311,973, Date of Patent: Nov. 13)
9. Aliev R A, Jabbarova K I and Huseynov O H 2014 T-norm, T-conorm and aggregation of Z-number Eighth WORLD Conference onintelligent systems for industrial Automation Tashkent, pp 159-167
10. Aliev R A, Alizadeh A V and Huseynov O H 2014 The arithmetic of discrete Z-numbers Information Sciences, accepted (DOI: 10.1016/j.ins.2014.08.024)
11. Aliev R A, Alizadeh A, Huseynov O H and Aliyev R R 2015 Arithmetic Of Z-numbers, The: Theory And Applications World Scientific, p 301
12. Kang B, Wei D, Li Y and Deng Y 2012 Decision Making Using Z-numbers under Uncertain Environment Journal of Information & Computational Science **V** 8(7) pp 2807-2814

13. Kang B, Wei D, Li Y and Deng Y 2012 A method of converting Z-number to classical fuzzy number Journal of Information & Computational Science **V** 9(3) pp 703-709
14. Yager R R 2012 On a View of Zadeh's Z-Numbers Advances in Computational Intelligence, Communications in Computer and Information Science 299 (USA) pp 90-101
15. Gavich I K 1985 Methods for the protection of groundwater from pollution and depletion (M.: Nedra) p 320
16. Muhamediyeva D T 2019 Aproaches to the Construction of Fuzzy Models of Intellectual Analysis of the State of the Low-Formalized Processes. 2019 International Conference on Information Science and Communications Technologies (ICISCT), Tashkent, Uzbekistan, pp 1-5
17. Muhamediyeva D T and Egamberdiyev N A 2019 Algorithm and the Program of Construction of the Fuzzy Logical Model International Conference on Information Science and Communications Technologies (ICISCT), Tashkent, Uzbekistan, pp 1-4
18. Muhamediyeva D T 2020 Application of the theory of fuzzy sets for a qualitative analysis of mathematical models Journal of Physics: Conference Series (DOI: https://doi.org/10.1088/1742-6596/1546/1/012091) **V** 1546 p 012091
19. Muhamediyeva D K 2020 Qualitative properties of wave solutions of the equation of reaction-diffusion of a biological population. International Conference on Information Science and Communications Technologies, ICISCT 2020, (9351464)