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IMPROVE DIALOG CATEGORIZATION OF THE METHODS FOR RISK ASSESSMENT OF ENVIRONMENTAL DANGER ECONOMICAL ACTIVITIES

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Abstract: The purpose of this work is to propose an advanced categorization of methods for risk assessment of environmentally hazardous sites that will help the consumers. To achieve it three tasks are solved: 1. Defining features of categorization methods; 2. Classification of methods for risk assessment; 3. Compilation of a catalog, which allows easy and proper choice of methods for analysis of environmental risk and application in solving practical problems.

Key words: risk, analysis, classification, systematization.

INTRODUCTION

In our attempts to categorize methods for assessing environmental risk were used two basic categories – measurability and applicability. They are not enough to cover all existing methods in a custom catalog.

The purpose of this work is to propose an advanced categorization of methods for risk assessment of environmentally hazardous sites to be of consumers help.

To achieve this we should solve the following tasks:

1) Defining features of categorization methods;

2) Classification of methods of risk assessment;

3) Compilation of a catalog, which allows easy and proper choice of methods for analysis of environmental risk and application in solving practical problems.

METHOD AND RESULTS

Categories and subcategories of methods for assessing the environmental risk are the basis for building a complete system. The categorization of relevance and measurability made by us is extended. Introduced are four new categories:

1) Management;
2) Specification;
3) Records;
4) Predictions.

For each are used 12 subcategories: 1) Actions; 2) Procedures; 3) Damages; 4) Reasons; 5) Follow-ups; 6) Situations; 7) Phenomena; 8) Impacts; 9) Harms; 10) Scenarios; 11) Degree of risk; 12) Degree of safety of environmentally hazardous sites.

Various economic activities are developed in different production conditions and circumstances.

Therefore, the risk is of a different nature and has specific features. It is therefore appropriate to make systematization of economic activities. For this purpose we were introduced subcategories that match NASE Rev.2 classification of economic activities in the European Union.

Analysis of the current development of methods for risk assessment shows that those obtained with numerical values of the degree of risk are easily applicable.

This appropriate for the risk to be ranged in descending gradation and presented in a systematic way. It's quick and without much difficulty, and is one of the main objectives of the risk assessment. Based on the ranging the priorities for risk treatment can easily be defined.

Ranging should be n-dimensional. To this end distributions are made on n- features. Experience [1,2,3] shows that it is appropriate to range in reasons, sources, levels of emissions and immission, in space distribution of immissions and others. Category and subcategories of the methods can also be used in these multi-measure distributions.

When applying methods metrical and non-metrical variables can be put in that may be:

I. Internal hazards of substances and equipment:

1) type of reactions (hydrolysis, oxidation, reduction, polymerization, etc.);

Scale probabilistic risk is quantified. It is used for variables such as:

2) reaction parameters (resistance, reactivity, exothermic, pressure or temperature of reactions, etc..);

3) physical and chemical properties of substances;

4) toxicity with "dose-effect", compatibility and incompatibility of substances;

5) quality of materials, terms and rules of use and storage;

6) demands and regulations for the storage of raw materials, other materials and production.

II. Severity of consequences:

1) type of damage caused to people under the action of the air shock wave, heat, toxic substances, etc.;

2) type of damage of the equipment;

3) type of environmental damage to air, water, land, buildings, equipment, etc.;

4) economic damages from impacts on equipment, raw materials, other materials, production, infrastructure and others.

III. Location and Environment:

1) components of the environment;

2) topographic data on the sensitivity of populations.

IV. Text formalization and information: 1) criteria, norms, standards; 2) rules, ordinances, regulations, laws; 3) historical data; 4) statistical information.

1) frequency of occurrence of dangerous activities and critical events;

2) incidence of incidents and accidents;

3) numerical historical data;

4) probability of occurrence of harm such as death, building damage, contamination of soil and water.

Those grounds are included in the systematization of methods for risk assessment presented in Tables 1 and 2. They are a new development for the systematization of methods for risk assessment. Presented are 24 probated methods that also include the established by us. Introduced is dialog categorization.

Currently assessment is accepted as real number without seeking interpretation of the causes, the conditions and circumstances that affect it. This is not used in assessing criticality. There is no sufficient versatility that would lead to a comparison on a united base.

The users with limited experience in risk assessment are in difficulty.

There are no instructions and no guidance system for evaluating techniques.

In order to assist users a system is introduced that includes 12 dialog questions:

1) Is the method appropriate for evaluation techniques and technologies?

2) Is the method appropriate for the design of equipment and technology?

3) Can we apply the method of quantitative risk assessment?

4) Is the method appropriate for assessing hybrid hazards?

5) Is the method appropriate for assessing cause-consequence relations of critical events?

6) Can the method be used to assess the degree of dependence between ecologically dangerous events?

7) Is the method appropriate for determining the law of distribution of critical events?

8) Whether higher qualification is needed to use the method ?

9) What is the degree of applicability and unification of the method ?

10) How needed are additional methods?

11) Can you check the credibility of the results?

12) What is the degree of applicability of the method?

To use the systematization three groups of answers are offered presented in Tables 1 and 2.

The first group is of binary qualitative answers – “yes” or “no”.

The second group is of combined quality responses: Yes; No; In combination with other methods; Not applicable.

The third group is of combined graded responses: lower; average; higher.

Methods are selected depending on the nature of the formalize question.

In systematization we included a variety of methods, as we set out for the fundamental. Once users have selected one or more of these methods can then expand your search by classification described signs. This could be used classifications checked out by us and in these studies [1,2].

Comparing the contents of methods for risk assessment gives rise to the following conclusions:

1) The main part of the methods primarily reflect characteristic categories of events that are created;

2) Closely oriented and too specific methods applied directly, and in many other cases take for granted, do not adapt, change and argue;

3) A crucial parameter for probabilistic analysis methods is the validity of the output data;

4) The most important thing is to discover regularities and hence rules for applying different methods. Thus, we introduce order, which will offset the ignorance of all the methods and differences in the competence of the people;

5) The modernization of the above methods is relevant and

The applicability of the methods of risk assessment is extremely wide, to prevent accidents by preparing mitigation of disasters and catastrophes. Covered treatment methods called environmentally hazardous sites and activities.

CONCLUSION

important issue that should be devoted efforts in the future because of the importance of risk to humans and the environment;

6) A number of methods are used extremely difficult because it does not allow to fully describe the phenomena studied, processes and conditions;

7) Suitable each method is accompanied with guidance for use;

8) For the application of complex methods need specialized training;

9) There are substantial differences between the analytical and objective methods for assessing risk;

10) A risk assessment using these methods should be taken into account and the influence of the subjectivity and human factors on the acceptance of eligible value.

Table 1

Dialog categorization methods for risk assessment of environmentally hazardous objects

Method	Is the method appropriate for evaluation techniques and technologies risks?	Is the method appropriate for technical and technological design?	Is the method appropriate for quantitative risk assessment?	Is the method appropriate for assessing hybrid hazards?	Is the method appropriate for assessing cause-consequence relations of critical events?	Can the method be used to assess the degree of dependence between ecologically dangerous events?
Forecasting the intensity of environmentally hazardous events /FPA/	No	Yes	Yes	No	No	No
Analysis "Fault Tree" /FTA/	Yes	Yes	Yes	Yes	No	No
Analysis of "Tree Event" /ETA/	In combination with other methods	In combination with other methods	Yes	In combination with other methods	Yes	Yes
Analysis of the structural scheme of environmental security /RBD/	In combination with other methods	In combination with other methods	Yes	Yes	No	No
Markovski analysis /MA/	Yes	Yes	Yes	Yes	Yes	Yes
Analysis "Petri nets" /PN/	Yes	Yes	Yes	Yes	Yes	Yes
Analysis of species and consequences of ecological hazardous events /FMEA/	In combination with other methods	In combination with other methods	Yes	No	No	No
Hazard analysis and working capacity /HAZOP/	Yes	Yes	No	No	No	No
Analysis of the reliability of the human operator /HRA/	Yes	No	Yes	No	Yes	Yes
Loading and tension analysis /LTA/	The criterion does not apply to this method	The criteria does not apply to this method	Yes	The criteria does not apply to this method	The criteria does not apply to this method	No
Analysis of the functional structure /AFS/	No	Yes	Yes	Yes	No	No
Statistical analysis /SA/	Yes	Yes	Yes	Yes	Yes	Yes
Analysis of types, effects and	Yes	Yes	No	No	No	No

criticality /FMECA/						
Logical analysis /LOA/	Yes	Yes	Yes	Yes	Yes	Yes
Control cards /CCT/	Yes	Yes	Yes	Yes	Yes	Yes
Pattern Recognition /FA/	No	Yes	Yes	No	Yes	No
Analysis of conditions and accidents /IA/	In combination with other methods	Yes	Yes	Yes	No	Yes
Morphology of the integral danger /ITD/	In combination with other methods	Yes	Yes	Yes	No	No
Theory of integral risk /ITR/	Yes	Yes	Yes	Yes	Yes	Yes
Situational modeling /SIA/	Yes	Yes	Yes	Yes	Yes	Yes
Scenario modeling /SCA/	Yes	Yes	Yes	Yes	Yes	Yes
Riskmetryc in the environmental security /RMT/	Yes	Yes	Yes	Yes	Yes	Yes
Structural and functional danger /SFS/	Yes	Yes	Yes	Yes	Yes	Yes

Table 2

Dialog categorization methods for risk assessment of environmentally dangerous objects

Method	Is the method appropriate for determining the law of distribution of critical events?	What qualifications is required to use the method?	What is the degree of applicability and unification of the method?	To what extent other methods are needed?	Can we verify the objectivity and accuracy of the assessment results?	What is the extent of the applicability of the method?
Forecasting the intensity of environmentally hazardous events /FPA/	Yes	Low	High	Average	Yes	High
Analysis "Fault Tree" /FTA/	Yes	Average	High	Average	Yes	High
Analysis of "Tree Event" /ETA/	In combination with other methods	High	Average	Average	Yes	Average

Analysis of the structural scheme /RBD/	Yes	Low	Average	Average	Yes	Average
Markovski analysis /MA/	Yes	High	Average	High	No	Average
Analysis "Petri nets" /PTR/	Yes	High	Low	High	No	Low
Analysis of species and ecological consequences of hazardous events /FMEA/	In combination with other methods	Low	High	Low	No	Висока
Hazard Analysis and performance /HAZOP/	No	Low	Average	Low	Yes	Average
Analysis of the reliability of the human operator /HRA/	No	High	High	Average	Yes	Average
Analysis of stress and strain /AN/	No	High	Average	High	Yes	Average
Analysis of the functional structure /AFS/	No	High	Average	High	Yes	Average
Statistical Methods /SA/	In combination with other methods	High	Average	High	Average	Low
Analysis of types, effects and criticality /FMECA/	No	Low	Average	Low	Yes	Average
Rational analysis /LOA/	Yes	Average	High	Average	Yes	High
Checklists process /CCD/	In combination with other methods	Low	High	Low	Yes	High
Pattern Recognition /FA/	Yes	High	High	Average	Yes	High
Analysis of conditions and accidents	Yes	Average	High	Average	Yes	Average
Theory of integral risk /ITR/	In combination with other methods	Low	High	Low	Yes	High
Situational modeling /SIA/	Yes	High	Average	High	No	High
Scenario modeling /SCA/	Yes	High	Average	High	No	High
Riskmetry in the environmental security /RMT/	Yes	High	Average	High	No	High
Structural and functional danger /SFS/	Yes	High	Average	High	No	High

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