Risk from the Perspective of the Emergency Management System

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Abstract
The incredible technological development of the last decades, the globalization of at least information, the cooperation at state, regional, global level, the removal of autistic dominant centers from the planetary equation and the appetite imposed by the increasing frequency of disasters and their effects have now led to a new beginning: a beginning of the challenge of the human struggle for man, for a climatic good, not against nature, for survival. In order to reduce the destructive potential generated by a natural disaster and the analysis of risks and vulnerabilities, man can intervene both in environmental control (stopping deforestation, pollution, irrational excavations) and through a more careful, more applied approach to technological elements. which may be the premises for the occurrence of a negative phenomenon (accidental pollution, nuclear accidents, global warming, hydrological hazard) thus increasing risk resistance and reducing vulnerability. Through an analysis of risk and vulnerabilities and a package of concrete and precise data covering the entire state level of critical infrastructure, private assets and particularities of communities, an impact assessment can be obtained that adjusts both response plans. but especially financial planning and economic development projections to offset the social, economic and environmental costs of the disaster. Such a pre-event and post-event evaluation can be the foundation of a future strategy. The main objective of the article is the analysis of the main categories of risks that define the management system of emergency situations based on the connection between them.

Keywords: risk, management, emergency situations, vulnerability

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Introduction

The link between disaster and development is now clear to everyone, and emergency risk management is gaining ground as an effective form of investment. However, most developing countries are limited in their ability to effectively integrate a strategic approach to this issue into national policy. Poor people in disaster-stricken areas are the hardest hit by losses and failures.

Development cooperation supports not only political but also economic, environmental and social development worldwide. It helps to improve living conditions and promotes sustainable development. Natural and man-made disasters are not just a challenge for developing countries. They are also a challenge for development cooperation and therefore strategies need to be developed and implemented to reduce the vulnerability of the population, as well as taking measures to reduce the risk of disasters (Pilemalm and Yousefi, 2020).

The factors that underlie the occurrence and development of risk are endogenous or exogenous, or in some cases are progressive-complementary, the action of one type of factor causing the occurrence of the other (Peduzzi et al., 2009).

Research and study of risk initiators can create a preamble to preventive measures that can eliminate or reduce the phenomenon with dangerous valences.

Risk management is a cyclical approach, carried out during an activity or a project, involving five operational levels (Cole, 2018):

- risk planning (allocation for each type and category of risk of a dedicated decision maker, at all institutional levels, being quantified from the organizational phase, as the decisive person, by the way of approaching the risk approach, as well as by the theoretical logistics be used);
- risk identification (all potential sources of risk that could induce the production of negative effects; creation of probabilistic scenarios as cause, action, effect);
- risk analysis (quantitative and qualitative statistical preview of the outstanding effects of each type of risk in case of its occurrence);
- establishing risk approach strategies (application of a correlation of methods, scales, mathematical and imaging procedures to be the foundation for the creation and operationalization of action tactics);
- risk monitoring and control (final phase of the process, resuming operations and evaluating them as a way of perception, action, effects, having a corrective role).

When analyzing the vulnerability, you must enter the elements in the risk algorithm (Albtoush, 2011):

- The characteristics of the natural event (its component elements);
- Economic characteristics of the affected area (existence of the necessary infrastructure for prevention, alarm, response);
- The socio-psychological characteristics of the population to be affected (the appetite and rigor of the citizens of Japan or South Korea to respond to the requests of local specialists and whistleblowers);
- Accidental random factor (possibility of persons or goods being voluntarily or involuntarily in risk areas: for example a passenger plane in flight may be struck by lightning, causing a catastrophe, the plane being accidentally there and being heavy to predict the place and time of the disaster, having only the risk, but the locality at the base of a mountain, following a massive snowfall can be destroyed by an avalanche, here having a known risk, quantified and accepted by authorities and residents despite existing warnings).

The decision-making problem from which we start our research approach is the answer to the following question: *what are the factors underlying the emergence and development of risks specific to emergency management*? This study aims to analyze the way in which the risk management system is perceived from the perspective of emergencies.

The structure of the paper is focused on several chapters: Introduction in which I described the general scientific framework. Literature that presents the latest approaches of risk management, then follows the research methodology that, in processing and analyzing the data collected, we used special software, which was special statistics, which was statistical calculation collaborators. The obtained results and the discussions present the way in which the managers, from several public institutions in Romania, perceive the emergency management system. The conclusions highlight the importance of developing policies, procedures and practices aimed at identifying, analyzing, evaluating, treating, monitoring and re-evaluating the risks specific to emergency management.

In conclusion, vulnerability is the way of resisting the consequences of hazard, identifying risk as a relationship between a phenomenon and its consequences. Risk is the ability to predict a reaction to the same type of disaster with the possibility of assessing the place of production, its intensity and its consequences. Its variable in the face of the same type of threat stems from the degree of vulnerability.

1. Review of the scientific literature

Disaster risk is made up of two basic elements: danger and vulnerability. Therefore, it is clear that a risk exists only if there is a vulnerability to the danger posed by a natural event. The identification of disaster risk starts with the identification of the danger and then followed by the assessment of the corresponding vulnerability, for example the possible repercussions in case of a natural phenomenon that is about to occur - heavy rains followed by floods (Băcanu, 2017).

Danger is an extremely natural event with a certain degree of probability of having negative consequences. A distinction must also be made between a real natural hazard and a socio-natural hazard. Given the complex set of influences, this distinction is difficult to make, but it is useful to help define disaster risk management measures (Geantă, 2014).

Vulnerability is exposure to hazards. Vulnerability denotes inadequate means or the ability to protect against the negative effects of natural events and, on the other hand, to recover quickly from their negative effects (Kaveh et al., 2022). Vulnerability includes very different, often reciprocal, factors that need to be considered in determining the vulnerability of a family, village, or country (Ghica and Zulean, 2017).

The human factor cannot intervene in the production of natural phenomena, but socio-natural hazards are induced or aggravated by a combination of extreme natural events and human interventions in nature (Robbins and Steven, 2003). The hazard is that circumstance or contest of circumstances (favorable or unfavorable) whose cause remains generally unknown, being unpredictable. Chance has recently become the most common term of the bodies involved in preventing, managing and eliminating the effects of natural disasters, gaining new value precisely due to the quantitative and qualitative dynamics of the cause-effect-solutions system being the main axiom of scenarios that can predict it. (Brown and Harvey, 2016).

The hazard is the latest science introduced in the curriculum of major universities, but it tends to be one of the most important and vast subjects by its size and importance. Thus, new valences of the term were created, which is currently broken down into 3 main categories (Buckingham, 2011): natural hazard; anthropic hazard; technological hazard.

Natural hazards are a direct consequence of natural phenomena such as storms, earthquakes, floods, droughts, fires, landslides. They are classified according to the way they are formed, the period of development, the affected area, their reversible or irreversible consequences (Buckingham, 2011). If the endogenous hazard is attributed to earthquakes and volcanic eruptions and the exogenous one is dependent on climatic, hydrological, biological factors, we find that these 2 categories are complementary, an endogenous hazard earthquake can cause a tsunami, exogenous hazard producing floods, or excessive heating (Manning, 2020). The climate can lead to the release of ice floes from the Arctic Circle, which can be carried by the currents, endangering the waterways, or the eruption of a Vulcan can affect air traffic (immediate and serious impact on society).

Anthropogenic hazard - phenomena generated by human interaction in the cycle of nature, triggered or favored by human actions and generating harmful effects (Buckingham, 2011). Excessive exploitation without environmental and climate feasibility studies of natural resources (forestry, mining, hydrographic, biosphere), chaotic development of human settlements, industrial centers, intervention on river basins, excessive pollution and indifference to the environment, represent the most dangerous trigger or adjuvant of the phenomena pending the disasters, the consequences being generally catastrophic (Trijp, 2018).

Technological hazard - is the direct and exclusive intervention of man on the environment through intentional or accidental action with often irreversible effects (Buckingham, 2011).

In conclusion, a classic hazard, in the old sense, which is a risk factor in a well-defined area can turn into a multiple risk, on the principle of dominoes, causing another, and another on continental territories if not and planetary (global warming causes the melting of the ice sheet to lead to rising ocean levels and directly to rising tides, being in danger of flooding including the area in the equatorial sector). But for the purpose of an exhaustive research, we must also analyze the hazard from the point of view of the specific area affected, i.e. we reverse the polarity of the risk equation, aiming not at the force or type of hazard but at the potential predisposition of the area to human and material damage. located in areas prone to risks, constructions not adapted as safety, lack of means of prevention, reaction.

Technical cooperation defines disaster risk management as a series of actions (programs, projects and / or measures) and tools that specifically aim to reduce disaster risk in regions at risk and mitigate the magnitude of disasters (Avram, 2019).

Disaster risk management includes risk assessment, disaster prevention, operational intervention to reduce human, material and financial damage and preparedness of the population and authorities in case of disaster (Ionescu, 2012). It is used in international debates to highlight the current tendency to take a proactive approach to the dangers posed by extreme natural phenomena. The intention is to completely reduce the risk of disasters in accounting for all risk contributors (risk management), as opposed to focusing on each hazard (Eitington, 2011).

2. Research methodology

The purpose of the article is to determine how managers in several public institutions in Romania (town halls, health institutions, educational institutions) perceive the emergency management system. The analysis of the emergency management system was made from the perspective of the following types of risks:

R1. Natural risks: refers to events in which the state parameters can be manifested in limits ranging from normal to dangerous, caused by dangerous weather phenomena, due to heavy rains and snow, temperature variations - frost, drought, heat wave - storms and destructive phenomena of geological origin, respectively earthquakes, landslides and landslides;

R2. Technological risks: include all the negative events that cause the exceeding of the safety measures imposed by regulations, as a result of some voluntary or involuntary human actions, the failures of the components of the technical systems, the failure of the protection systems;

R3. Biological risks: refers to the negative consequences on human, animal and plant communities, caused by diseases or other events related to health and which affect an unusually large number of individuals;

R4. Fire risk: is the most common risk that occurs and its production is a special emergency, a phenomenon that affects important areas of economic and social life, such as construction, installations, landscaping, forests, means of transport, agricultural crops.

Based on the purpose of the scientific research, the following objectives have been drafted:

- Analyzing the emergency management system;
- Risk analysis that defines the emergency management system;
- Identifying the links between risks.

Based on studies and theories in the field of literature and personal observations, the following hypotheses have been formulated that underlie scientific research:

Hypothesis 1: There is a strong correlation between R1.Natural risks and R2.Technological risks;

Hypothesis 2: There is a very significant positive relationship between R1.Natural risks and R3.Biological hazards;

Hypothesis 3: Between R1. Natural risks and R4.Fire risk there is a very significant positive relationship;

Hypothesis 4: There is a positive relationship between R2.Technological risks and R3. Biological risks;

Hypothesis 5: Between R2.Technological risks and R4.Fire risk there is a very significant positive positive relationship.

The data collection was carried out between November 2021 and February 2022, using the questionnaire. A total of 312 valid questionnaires were obtained. The questionnaire applied was a mixed one, including both open and closed questions and control questions. It also includes: dichotomous questions (with Yes or No answers), open-ended questions that allow answers of unspecified length, questions with choice answers, named and semi-open (a limited number of specified answers), semantic questions in scale, called and questions with answers ranked in ranks (Likert scale - through which the preferences of individuals can be tested gradually). The results obtained were recorded, stored and structured, obtaining the database necessary for the analysis. The recorded data were subjected to adjustment, grouping, aggregation and coding operations for easier processing, analysis and interpretation. Thus, a database was created that could be used electronically.

In the processing, processing and analysis of the collected data, the special statistical research software S.P.S.S. (Statistical Package for the Social Sciences), with which the Spearman rho Correlation Coefficient was calculated.

3. Results and discussion

To validate the hypotheses, we used the most common and by far the most useful, the Spearman rho correlation coefficient, with the help of the special statistical research software S.P.S.S. (Table no.1).

Following the analysis of the Spearman rho correlation coefficient, we can observe the following correlations between the different process elements that make up the public management system:
1. There is a very significant positive relationship between *R1.Natural risks* and *R2.Technological risks* (rho = 0.92, df = 310, p <0.001). From the scatter plot (Figure no.1) it can be seen that the point spread is relatively limited, which indicates a strong correlation ($R^2 = 0.81$). The slope of the scattering of the results is relatively straight, indicating a linear relationship rather than a curvilinear one. It can be stated that Hypothesis 1 has been validated**.**

Table no. 1. Spearman rho correlation coefficient values

Correlations					
Spearman's rho		R1.Natural risks	R2.Technological risks	R3.Biological risks	R4.Fire risk
R1.Natural risks	correlation coefficient	1.000	.921**	.837**	.823**
	Sig. (2-tailed)		.000	.000	.000
	N	312	312	312	312
R2.Technological risks	correlation coefficient	.921**	1.000	.800**	.784**
	Sig. (2-tailed)	.000		.000	.000
	N	312	312	312	312
R3.Biological risks	correlation coefficient	.837**	.800**	1.000	.895**
	Sig. (2-tailed)	.000	.000		.000
	N	312	312	312	312
R4.Fire risk	correlation coefficient	.823**	.784**	.895**	1.000
	Sig. (2-tailed)	.000	.000	.000	
	N	312	312	312	312

Source: processing data obtained through SPSS program

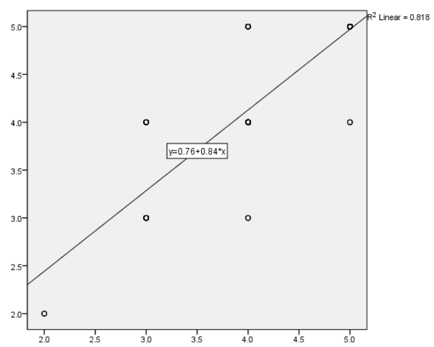

Figure no.1. Dispersion diagram - correlation between R1. Natural risks and R2.Technological risks

Source: processing data obtained through SPSS program

Technological risks are associated with industrial activities. Awareness of the dangers associated with technology, the effects on environmental factors and the social implications have arisen as a result of serious accidents, which have demonstrated the need for an integrated approach to the field. ways, but requiring a more elaborate and personalized management on each category.

2. It can be seen from Table 1 that there is a very significant positive relationship between *R1. Natural risks* and *R3.Biological risks* (rho = 0.83, df = 310, p <0.001). The scatter plot (Figure no.2) shows that the point spread is relatively limited, indicating a strong correlation (R^2 = 0.67). The slope of the scattering of the results is relatively straight, indicating a linear relationship rather than a curvilinear one. In conclusion, Hypothesis 2 is validated.

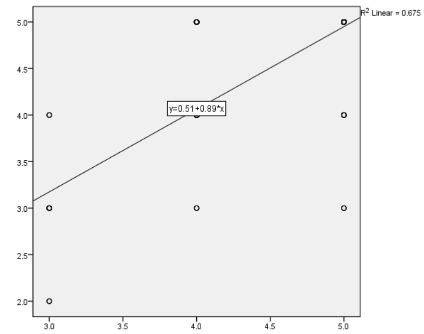

Figure no.2. Dispersion diagram - correlation between R1. Natural risks and R3.Biological risks
Source: processing data obtained through SPSS program

Recently, there has been a worrying increase, both in the world and in Romania, in the manifestation of natural hazards and, in particular, in floods, landslides and landslides, which has led to loss of life and damage. important materials. Although the occurrence of most natural hazards cannot be prevented, their effects can be reduced by proper management by the competent authorities at local, regional and central level, all the more so as, in general, their areas of manifestation can be reduced. be known. Reducing the risk associated with natural phenomena to an acceptable level requires a number of measures and actions, embodied in prevention policies and impact reduction programs, which, however, depend on the economic possibilities of practical application.

3. Between *R1. Natural risks* and *R4.Fire risks* there is a very high significant positive relationship (rho = 0.82, df = 310, p <0.001). In Figure no.3, the scatter plot shows that the point spread is relatively limited, indicating a strong correlation. The slope of the scattering of the results is relatively straight, indicating a linear relationship rather than a curvilinear one.

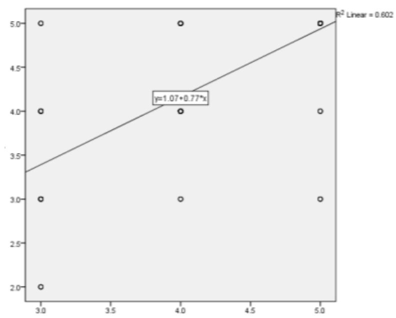

Figure no. 3. Dispersion diagram - between R1. Natural risks and R4.Fire risks
Source: processing data obtained through SPSS program

It can be stated that Hypothesis 3 is fully validated.

4. Analyzing R2.Technological risks and R3.Biological risks results in a very high positive relationship (rho = 0.80, df = 310, p <0.001). The scatter plot (Figure 4) shows that the point spread is relatively limited, which indicates a strong correlation (R2 = 0.61). The slope of the scattering of the results is relatively straight, indicating a linear relationship rather than a curvilinear one. It can be stated that Hypothesis 4 is validated.

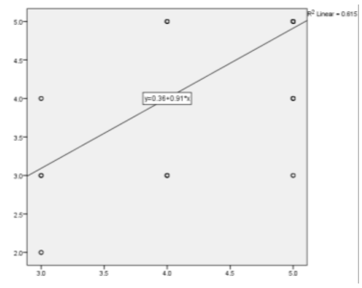

Figure no.4. Dispersion diagram - correlation between R2.Technological risks and R3.Biological risks
Source: processing data obtained through SPSS program

5. Between *R2.Technological risks* and *R4.Fire risk* there is a very significant positive relationship (rho = 0.84, df = 310, p <0.001). The scatter plot shows that the point spread is relatively limited, indicating a moderate to strong correlation (R^2 = 0.54) - Figure no.5 The slope of the scattering of the results is relatively straight, indicating a linear rather than curvilinear relationship - Hypothesis 5 is validated.

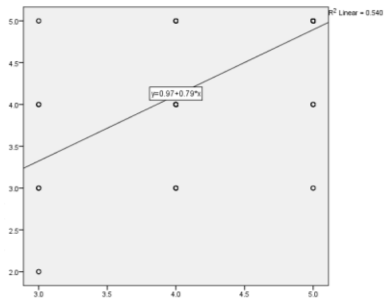

Figure no.5. Dispersion diagram - correlation between R2.Technological risks and R4.Fire risk

Source: processing data obtained through SPSS program

6. There is a very significant positive relationship (rho = 0.89, df = 310, p <0.001) and between R3.Biological risks and R4.Fire risks (Table no.1). The scatter plot (Figure no.6) shows that the point spread is relatively limited, indicating a moderate to strong correlation (R^2 = 0.74). The slope of the scattering of the results is relatively straight, indicating a linear relationship rather than a curvilinear one.

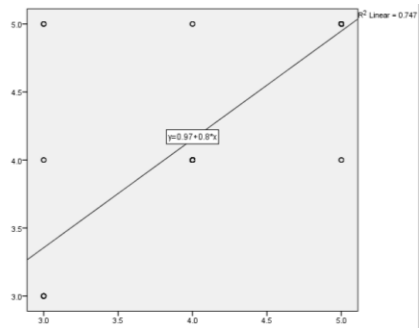

Figure no.6. Dispersion diagram - correlation between R3. Biological risks and R4. Fire risks

Source: processing data obtained through SPSS program

Fire safety is defined as the management of specific fire risks at all levels, by preventing fires, protecting the population from their effects and optimizing the intervention. Currently, it is an essential requirement for building design, fire being the determining factor in the sizing of buildings of exceptional and special importance. The technical approach to fire safety consists in the application of specific technical principles and calculation methods to assess the minimum level of protection and to design and calculate the necessary safety measures, these being included in specific regulations, established at European level by the Directive on construction products and subsequent documents, mainly EC decisions on Euroclass reaction to fire and fire resistance.

Conclusions

Emergency management should mean the application of policies, procedures and practices aimed at identifying, analyzing, assessing, treating, monitoring and reassessing risks in order to reduce them. Risk is the main challenge and threat of the emergency management system, the latter having as professional and operational desideratum: risk planning, their identification, qualitative and quantitative analysis, establishing approach strategies, monitoring and controlling it within assumed safety limits. In order to obtain this indicator of performance, study and risk eradication, the emergency management system has imposed and manages the collection of quantities and variations of data from all fields, areas and cultural and social levels, with the predestined purpose of subject to SWOT techniques, the result of which will be the basis for decisions to identify, respond and eliminate risk leading the decision maker to maximize the proposed policies.

Thus, in the context of similar research, the emergency prevention strategy forms the framework document for the preparation and adoption of specific measures and actions aimed at reducing the impact of the manifestation of specific risk factors on the population, property and environment through planning , at national and local level, in the medium and long term, of a set of specific actions and measures. A direct asset, pending the achievement of the performance indicator targeted by the emergency management system, is the professional quality, experience and decision-making capacity of the system manager or command group. And in this case, following the study, we found that in order to be a good manager, in addition to the necessary statutory skills, it is mandatory to have an idea package based on a very varied and intercomplementary performance algorithm. In addition to basic, specialist training, the individual or group proposed to be the decision-maker must be able to analyze, quantitatively and qualitatively, the whole data package, disseminate it, prioritize it according to effects, make decisions in optimal time, but with implications and for short or long periods, to be familiar with the particularities pending the vulnerability of the target area and population, to transmit and apply decisions in a concrete, concise way, constantly trying to place themselves in the category of certain, in certain to the detriment of those at risk or uncertain. Also, his professional training must be perfect and continuous, being permanently connected to all international studies and organizations in the field. The decisions taken, preventive, immediate action, reconstruction, must be subsequently algorithmized to extract the elements of novelty, the discrepancies between the event and the reaction, the gaps and the need not covered by the risk scenarios. The conclusions must also be introduced not only in the emergency management system, but also in national, local and international policies in order to be disseminated, perceived fairly, funded and assumed by decision-makers.

In conclusion, the position of manager in the emergency management system must be assumed as important both in the architecture of institutional command of the state to obtain the character of authority, but also in the scale of multidisciplinary professional skills guided by open-minded thinking. always evolutionary progress.

References

Albtoush, R., Dobrescu, R. and Ionescou, F., 2011. A hierarchical model for emergency Management Systems. *UPB Sci. Bull.*, 73(2), pp.53-62.

Avram, C., 2019. *Modeling - managerial simulation of risks and disasters*. Bucharest: Telegrafia.

Băcanu, B., 2017. *Analysis techniques in strategic management*. Bucharest: Polirom.

Brown R. and Harvey, D., 2016. *An experiential approach to organization devepopment.* New Jersey: Prentice Hall.

Buckingham, M., 2011. *Now, discover your strengths*. New York: The Free Press.

Cole, G.A., 2018. *Personnel management*. London: Codecs.

Eitington, J., 2011. *The winning trainer, winning ways to involve people in learning*. Houston: Gulf Publishing.

Geantă, Ş., 2014. *Civil protection - the dimension of national security*. Bucharest: Telegrafia.

Ghica, L.A. and Zulean, M., 2017. *National security policy. Concepts, Institutions, processes*. Bucharest: Polirom.

Ionescu, S., 2012. *The impact of hydrotechnical arrangements on the environment.* Bucharest: H.G.A.

Kaveh, A., Javadi, S. and Mahdipour, R., 2022. Emergency management systems after disastrous earthquakes using optimization methods: A comprehensive review. *Advances in Engineering Software,* 149(1), pp. 123-132

Manning, S., 2020. Exploring the process of strategic planning in emergency management. *International Journal of Emergency Management*, 16(2), pp. 152-178

Peduzzi, H., Herold, C. and Mouton, F., 2009. Assessing global exposure and vulnerability towards natural hazards: the Disaster Risk Index. *Natural Hazards Earth Syst. Sci.*, 9(2), pp. 1149–1159

Pilemalm, S. and Yousefi, K., 2020. ICT enabled cross-sector collaboration in emergency response: emerging forms of public-sector network governance. *International Journal of Emergency Management,* 16(3), pp. 249-280

Robbins, P. and Steven, C., 2003. *Managemen*t. Hoboken: Prentice Hall.

Trijp, J., Boersma, K. and Groenewegen, P., 2018. Resilience from the real world towards specific organisational resilience in emergency response organisations. *International Journal of Emergency Management*, 14(4), pp. 152-178