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Institute of Geography
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Geology and Geophysics

Abstracts of
The Second Eurasian RISK-2020
Conference and Symposium

Editor

- **Vugar Aliyev**

"Innovations in Minimization of Natural and Technological Risks"

"Minimization of the Most Prevalent Project Risks in the Oil and Gas Industry"

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12-19 April, 2020
Tbilisi, GEORGIA

RISK-2020

Vugar Aliyev
(Editor)

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The Second Eurasian RISK-2020 Conference and Symposium

RISK-2020 (12th – 19th April 2020)

- *Innovations in Minimization of Natural and Technological Risks*
- *Minimization of the Most Prevalent Project Risks in the Oil and Gas Industry*

Jointly organized by



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12th – 19th April 2020

- Innovations in Minimization of Natural and Technological Risks
- Minimization of the Most Prevalent Project Risks in the Oil and Gas Industry

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AMIR Technical Services LLC

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RISK-2020

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RISK-2020

About RISK-2020

The main purposes of the Second Eurasian RISK-2020 Conference and Symposium was *to unite* scientists and specialists from different fields of knowledge and give them opportunities to share - information, ideas and innovative solutions in minimization of the natural and technological risks on the Eurasian continent, *promote* knowledge exchange on risks, innovations and advanced technologies of risk minimization and *support* Millennium Challenges and Sendai (March 18, 2015, Japan) Framework for Disaster Risk Reduction 2015-2030 under UNO. The RISK-2020 Conference and Symposium will serve as a perfect venue for practitioners, engineers, researchers, scientists, managers and decision makers from all over the world to exchange ideas and technology about the latest innovation developments dealing with risk minimization.

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Chairman's Message

Dear colleagues, ladies and gentlemen!

It's our pleasure and honour to welcome you in Tbilisi, Georgia at the Second Eurasian – Conference and Satellite Symposium. The main purposes of the Second Eurasian RISK-2020 Conference and Symposium are *to unite* scientists and specialists from different fields of knowledge and give them opportunities to share - information, ideas and innovative solutions in minimization of the natural and technological risks on the Eurasian continent, *promote* knowledge exchange on risks, innovations and advanced technologies of risk minimization and *support* Millennium Challenges and Sendai (March 18, 2015, Japan) Framework for Disaster Risk



Reduction 2015-2030 under UNO. Events taking place as in Eurasia, as all over the world, feature intensification of global problems related to provision of complex security of population and territories from natural and technological emergencies. Over the past 25 years, disasters and technological emergencies in the world have killed more than 3 million people and over 1 billion have suffered casualties. Undoubtedly, it takes continuous study and monitoring of risks for population and territories and search of effective control mechanisms in order to prevent emergencies and minimize their consequences.

Additionally, recent major accidents on the Deepwater Horizon drilling rig in the Gulf of Mexico in 2010, the Californian San Bruno pipeline explosion in 2010, the blowout and consequent fire on board of Sakhalin-2 (Russia) offshore platform in Okhotsk sea in 2013, – the deadly fire break-out in the Gunashli (Azerbaijan) oilfield platform in the Caspian sea in 2015 are strong reminders of the importance of being prepared for emergency situations and are constantly influencing the activity of national and international regulators.

We are pleased that some Eurasian countries have gained considerable experience on the given topic. Nevertheless, the world scientific community expresses concern of people and countries being victims of accidents and disasters, death and suffering, destruction of historical values. We think that the root cause of large number victims arises from insufficient explanatory work, estrangement from attempts to warn about and prevent emergencies as well as from deficiency of work done on development of risk minimization systems for natural and anthropogenic emergencies. Emergencies remain one of the most serious obstacles in achieving sustainable development. Therefore, the development of innovative solutions in the field of minimizing risks will help strengthen sustainable development, as well as create new methods for reliable protection of the population from emergency situations. Taking into consideration the presence of such organic interrelation between the minimization of emergency risks and sustainable development of the countries it is important to involve all interested parties working on assessment, analysis and management of risks.

We appeal to all interested parties to take an active part in the Conference and Symposium RISK-2020, to share experience and knowledge, and to contribute to common cause of Eurasian continent steady progress. Georgia, known for centuries-old traditions of hospitality, high science and culture, will leave not only good memories of its nature, people and specialists, but will also give a concrete orientation to the next Third Eurasian Conference RISK - 2021.

With sincere wishes for an effective, successful and productive conference!

A handwritten signature in blue ink, appearing to be 'V. Aliyev', written in a stylized, cursive manner.

Prof. Vugar Aliyev
Chair of the Organizing Committee
Director of the International Event Organizer Company
AMIR Technical Services LLC

The Use of Drone in Risk Assessing of the Mining Works Performance – Case Study

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ABSTRACT

Monitoring of the mining works performance and their success as well as the assessment of possible risks is one of the daily requirements in mining. One of the most important segments of mineral exploitation is the condition of the mine works after blasting since people's safety can be compromised after blasting. Very often, due to the terrain morphology and limited or even disabled access to the benches, it is not possible to capture all points and collect data using classical surveying methods. In order to reduce the risk of any threat, it is necessary to monitor the mining works and evaluate the success of their performance in a safe manner, and this is possible using unmanned aerial vehicles e.g. drones.

In this article data collection and risk analysis was done on the surface quarry “Tambura”, located in the Republic of Croatia, in the western part of the Istrian peninsula, about 8 km northwest of Pula. The quarry “Tambura” in which a crushed building stone is mined is covering a total area of 3,79 ha and is wide 285 m and long 181 m. As a result of blasting in the south part of the quarry, too much rock was blasted in the form of rock material overcut on the highest bench. This compromised the stability of the bench, surrounding terrain and therefore the safety of people inside and outside of the quarry. The analysis of the mining works performance and risk assessment was carried out in five steps:

- 1) Identifying potential hazards and risks (identifying hazards that could cause harm and anticipate occupational hazards and circumstances that may cause potential hazards that cause harm, injury or illness),
- 2) Identifying participants at risk and how they are exposed to risk (identifying workers and other people who may be exposed to hazards and determining how and in what way, how long and how often workers are exposed to hazards/risks),
- 3) Risk assessment (assess the likelihood of an adverse event occurring and the severity of the possible consequence and to conclude on the gravity of the possible consequences),
- 4) Documenting and recording the results of the risk assessment (documenting the identified hazards, hazardous situations and exposure characteristics and recording the results of the risk assessment),
- 5) Decision on corrective and preventive measures (identifying appropriate activities and actions to minimize or reduce risk and prioritize the implementation of preventive and corrective measures).

Site data (aerial digital photographs) were collected with the photogrammetric data collection method instead of conventional surveying methods using unmanned aerial vehicle DLI Phantom 4 Pro V2.0 (drone weight 1375 g, camera sensor 1” CMOS, effective pixels 20M, remote controller max transmission distance FCC: 7 km, CE: 4 km). 12 control points were marked on the ground surface and measured with high accuracy of ± 3 cm error in both horizontal and vertical direction. The photographs were taken at the height of 50 m above the ground surface and were acquired in two flyovers. Aerial photos overlap was 80% and the ground sampling distance (GSD) was 1,45 cm/px and a total of 785 photographs were taken and processed in Bentley Context Capture CONNECT Edition software.



Analysis of the risk assessment was made using two different models: a three-dimensional photogrammetric model and two-dimensional orthophoto model of the terrain and mining works. The risk analysis was performed after blasting on 30 x 150 m area located in the south part of the quarry. The analysed area is a part of the highest bench with a maximum height of 23 m in the eastern part, which decreases to only 5 m on the western part with designed bench slope of 70°. First analysis was carried out on the two-dimensional orthophoto model created from the collected aerial data. The area was analysed by plotting the peak parts of the bench after blasting and comparing them with the designed mining works contours. The analysis revealed that the mining works after blasting correlates to the design parameters and that they were performed with great precision. Measurement was conducted at regular intervals of 10 meters, and a total of 19 measurements were made. The average deviation of the performed mining works in relation to the mine design is 0,816 meters while the minimum deviation is 0,042 m and the maximum deviation is 3,497 m. Second analysis was carried out on the three-dimensional photogrammetric model. The 19 measurements were carried out at the same locations as well as on the two-dimensional orthophoto model in order to compare the results. Considering the three-dimensional model display capabilities, parts of the highest bench were observed, where a part of the rock mass was over blasted behind the designed slope and below the terrain. A mining works line was plotted on the parts of the bench toe where the maximum deviation from planned mining operation were assumed. The minimum deviation of the performed mining works from the planned state is 0,096 m, the maximum deviation is 4,686 m and the average deviation is 1,025 m.

The continuous insight into the mining works performance in relation to the mine planned model is a necessity of every mining operation. The application of this method allows for fast and easy but above all secure data collection from a safe distance. Based on the performed analyses, a greater deviation of the performed mining works on the three-dimensional photogrammetric model is observed compared to the two-dimensional model. The reason for this is the ability to display terrain and bench parts with a three-dimensional model that are not available or difficult to display in a two-dimensional model. The risk assessment based on the two-dimensional model does not provide sufficiently precise results for deciding on corrective and preventive measures for risk prevention. On the other side development of the three-dimensional model of the current situation ensures the assessment of possible risks in the shortest possible time and its timely prevention so the best risks correctional and prevention measures can be brought.