

**UNIVERSITY OF PETROSANI
DOCTORAL SCHOOL**

SUMMARY of the Doctoral Thesis

**”INTEGRATED MANAGEMENT SYSTEM OF ENVIRONMENTAL QUALITY, SAFETY AND
OCCUPATIONAL HEALTH IN THE JIU VALLEY COAL BASIN”**

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The issue related to the integrated management systems (IMS) of environmental quality, safety and health at work incorporates requirements that different standards of the management systems can be found in application solutions in a single all-encompassing, integrated system.

The studies, researches and results of scientific investigations in the field on an international level show, synthetically, that the implementation does not necessarily occur through imposed regulation, but through articulations, compositions, compatibility between factors, parameters, causes and consequences in an operational system of advanced knowledge and decisions in the face of anthropogenic factors.

It is important that integration rounds are as short as possible, implementation allows for as high levels of integration as possible, and spatio-temporal ecological vulnerabilities are mastered.

The doctoral thesis is, in essence, an innovative, original project for the protection of the environment, its quality, occupational safety and health, useful in reducing ecological vulnerability in a mono-industrial mining area, the Jiului Valley, sensitive socio-economically and industrially, undergoing drastic restructuring, with major changes already underway for over 30 years, still without final results assumed to be adequate.

In the Jiului Valley, the integration of natural and anthropogenic factors based on resource subsystems involves the selection of indicators that reflect the zonal ecological conditions with determined weights, or through the analysis of anthropogenic impacts resulting from entropy weighting.

In the Doctoral Thesis, the default levels of spatio-temporal vulnerability, results of trend analysis, ways of contributing to ecological restoration, management of environmental quality, safety and occupational health in the Valea Jiului Carboniferous Basin are presented.

In fact, it is of interest to establish the degree to which the Valea Jiului Carboniferous Basin as a system suffers damage due to exposure to mining hazards and disturbances, if it can be a question of resilience, adaptability and stability against pollution and specific ecological impacts.

It is found that in the Jiului Valley, due to the imprecision of the ecological impact and the lack of quantitative or qualitative information, a state of inaction is maintained in the mining and post-exploitation processes, and the degree of prudence of the decision-makers and acceptable risks are not found in the priorities managerial, in real-time actions.

The doctoral thesis is written over 229 pages.

The work contains a total of 106 graphic representations (diagrams, drawings, figures, images), of which 57 are original, developed by the author for the first time in specialized literature, 21 tables with research data and information, new relationships and mathematical formulas, to which are added own ideas, concepts and notions launched for the first time in the field, all of which are subject to copyright, listed in specific Indexes.

The doctoral work, in its structure, has 8 chapters, bibliography with 235 references from the country and abroad, also 24 personal bibliographic references, of which 2 ISI quotes.

In the doctoral thesis, each Chapter begins with the statement of the main objective and the pursued derived objectives and ends with preliminary conclusions, according to the theme and the requirements of personal scientific contribution.

CHAPTER I is entitled **THE EXPLOITATION AND VALUATION OF FOSSIL FUELS ON THE INTERNATIONAL PLAN, IN ROMANIA AND IN THE JIU VALLEY BASIN.**

The practical, real situations and trends in the field of coal exploitation at national level, in the EU and internationally are described; the understanding and acceptance of the motivations for the establishment in large mining perimeters of the Integrated Management Systems of the quality of the environment, safety and health at work is presented.

The transition to post-coal is addressed and alternatives are proposed, variants of the contribution of the Valea Jiului Carboniferous Basin to overcome overlapping crisis situations (2022), emphasizing the requirement to re-operationalize the exploitation of residual energy coal deposits respecting the environmental quality requirements, regarding safety and health at work.

In the Valea Jiului mining area, there are major concerns regarding the anthropogenic changes to the environment generated by the extractive industry and the socio-economic effects of the restructuring of the regional mining sector.

In the Chapter are systematized the factors affecting the environment, the influences on the health of employees and the population, the evolution of mining perimeter closures, these, along with inefficiency, are motivations for the restructuring process of the Valea Jiului Basin, but with consequences on Romania's energy security.

CHAPTER II is called **COAL EXPLOITATION AND ENERGY PRODUCTION. ENVIRONMENTAL ISSUES, SAFETY AND HEALTH AT WORK.**

They mainly deal with the causal links between underground oil mining, energy production and environmental, occupational health and safety issues.

The characteristics of some exploitation framework technologies that have a potential impact on the deposit and the surrounding environment are expressed, and the requirement to avoid irrecoverable losses of coal in the exploited space with the risk of self-ignition is insisted upon.

The new research concept of the process of underground oil exploitation from micro-scale, through meso-scale to macro-scale and the influences on the socio-technical developments in the anthropogenically affected mining industrial environment in the Jiului Valley is described.

For the first time, matrix models of problematization elements for solutions aimed at the environment in the Jiului Valley, towards sustainability, are presented.

CHAPTER III is entitled **CRITICAL ANTHROPIC SITUATIONS, AFFECTS OF ENVIRONMENTAL QUALITY, HEALTH AND SAFETY AT WORK IN THE JIULUI VALLEY MINING BASIN.**

The identification of the parameters of anthropogenic effects in the studied area, their introduction into the Integrated Mining Management System, represents the recognition of environmental management as a priority for meeting the quality requirements, regarding safety and health at work.

In the Chapter it is shown that the industrial mining sites in the Jiului Valley are highly complex, and the polluting actors of the environment, even if they are reduced in number, are extremely aggressive, with reference to explosions, sorting, washing and preparation of coal, coal burning in thermal power plants, tailings piles, mine polluted waters, landscape disturbance, land subsidence. Major accidents such as surprises and gray gas explosions are domain specific.

At the same time, problems related to the deformations of the underground mining space and the subsidence-type effects on the mining lands on the surface in the Jiului Valley are treated in an original manner.

The data and information systematized and processed in this Chapter motivate the need to conceptualize the Integrated Management System in the field.

CHAPTER IV has the title ENVIRONMENTAL QUALITY MANAGEMENT, SAFETY AND HEALTH AT WORK IN THE JIU VALLEY BASIN.

The opportunities for the application in the Jiului Valley of an Integrated Management System for quality-environment-safety and occupational health are listed.

In this framework, managerial proposals are launched for the introduction of high-performance mining environment control techniques and technologies with reference to the requirements of environmental quality, safety and occupational health.

Some theoretical and practical premises regarding the management of environmental quality, safety and occupational health in the Jiului Valley are presented.

A managerial proposal regarding the prediction of surface subsidence (Cazul Minei 5 Sud Lupeni) is described for the first time, as well as a proposal to solve the anthropogenic situation of the land above the extraction panels.

The own conception related to the anthropic remediation of environmental damage through optimized constructive-functional formulas of mining equipment and machinery is suggestively presented.

It is recommended to resort to the use of rock support and stabilization devices in the rock massif, or in the coal strata, respectively, the connection to a Center for measuring deformation signals from the underground is proposed.

CHAPTER V refers to the PROPOSAL OF AN INTEGRATED SYSTEM OF MANAGEMENT OF ENVIRONMENTAL QUALITY, SAFETY AND HEALTH AT WORK.

In this context, the presentation of the Quality Management System and the Integrated Management System/Integrated Management System is made, with reference to advantages and benefits in the Valea Jiului Carboniferous Basin.

An own scheme was developed regarding the Integrated System for monitoring and solving anthropogenic environmental situations in the Valea Jiului Basin, and at the E.M. Dispatch. In Lupeni with the Telegravimetric Control Station, the proposal was made to complete the digitalization infrastructure for monitoring rockfalls, surprises, collapses, layer breaks, excessive mining pressures, tunnel deformations.

An operational scheme of a multitude of indicator sub-systems, vision and strategy for the composition of the integrated environment and health system in the Valea Jiului mining area is being developed.

At the same time, some challenges are presented for the Valea Jiului Basin associated with anthropogenic industrial and socio-economic impacts within the Integrated Management System of environmental quality, safety and occupational health.

CHAPTER VI is entitled SMART MINING. PROPOSAL FOR PROCESSING AND MANAGEMENT CENTER FOR DECISIONS OF INFORMATION, SAFETY AND OCCUPATIONAL HEALTH (CPGDI_{mss}).

The central objective of this Chapter is the proposal of a Processing and Management Center for Environmental, Safety and Occupational Health Information Decisions (CPGDI_{mss}) for the Valea Jiului Carboniferous Basin.

The opportunities of applying intelligent mining in the Integrated Management System in the Jiului Valley are described, the call for intelligent eco-techno-sustainable mining systems is drawn up.

In this framework, it was resorted to launching a proposal to introduce the network with transitional informational nodes tracked on intermediate computers / hardware, with signals to the Center (CPGDI_{mss}).

The distribution of mining operationalization levels to reach intelligent mining is described; the compound mode on mechanization, automation, robotization, up to the actual digitization of mining operations is presented.

In this framework, the concept of the fluidized technologization of underground oil through fluidized exploitation and advanced conversion chambers is presented; the in-situ gasification is described, the forward Complex integrated in areas of intersections of the abattoir with equipment from the base gallery is presented. Essentially, originally, for the first time, as an own scientific contribution, the proposal for the establishment and operation of the Integrated Management and Processing Center of environmental information flows in the Valea Jiului Carboniferous Basin (CPGDI_{mss}) is presented.

CHAPTER VII has the title PROGRAM FOR THE IMPLEMENTATION AND DEVELOPMENT OF THE INTEGRATED MANAGEMENT SYSTEM (CPGDI_{mss}) IN THE FRAMEWORK OF THE HUNEDOARA S.A. ENERGETIC COMPLEX.

In this context, the program for the implementation and development of the Integrated Management System, which includes the Processing and Management Center for Environmental, Safety and Occupational Health Information Decisions (CPGDI_{mss}) for the Valea Jiului Carboniferous Basin/ within the Hunedoara Energy Complex S.A. is presented.

Applications preceding the operationalization of SIM in (CPGDI_{mss}) through the Rapid Impact Assessment Matrix (RIAM) and the Leopold matrix are described and the proposal for digitized information extension in the Center (CPGDI_{mss}) is advanced.

At the same time, the methods for measuring, controlling and evaluating the application, operation of the Integrated Monitoring System (SIMo) within the (CPGDI_{mss}) are established.

The set of "environmental components" related to the researched area was compiled by selecting 36 options in comparison with a number of 112 factors taken into consideration for questionnaire responses from decision-makers in the field;

From the 36 options, by performing the ratio between Amplitudes (Effects) and Importance (Weights), respectively the ratio between the values from different scales, a number of 24 factors (69.75%) register negative values. As such, it is proven that the anthropogenic impacts in the Valea Jiului Basin remain negative and the need for action and commitment to resolve dysfunctions in the field is confirmed.

The test carried out confirms the proposal to establish the Processing and Management Center for Decisions on Environmental, Safety and Health at Work (CPGDImss), with the help of which to obtain data and information to be offered to decision-makers and those who solve environmental dysfunctions.

CHAPTER VIII refers to FINAL GENERAL CONCLUSIONS, PROPOSALS AND RECOMMENDATIONS, HIGHLIGHTING OWN, ORIGINAL CONTRIBUTIONS AND FUTURE RESEARCH DIRECTIONS.

In this conclusive framework, the main aspects derived from the study and conceptual analysis of phenomena, methods, applications and acquired results are systematized.

The presentation of one's own contributions in the area of the topic under study within the doctoral thesis, highlights the original theoretical and applied contributions, with great interest being given to the way in which they can be integrated and capitalized.

In essence, the original proposal advanced by the author is presented, that of the establishment and operation of the Center for Processing and Management of Environmental, Safety and Occupational Health Information Decisions (CPGDImss).

From the results obtained through the broad research of the theme and the area accepted as a case study, final general conclusions, proposals and recommendations, respectively own, original scientific contributions are presented.

The conclusions, proposals and recommendations, the synthesis of the own, original scientific contributions, obtained from the scientific investigation of the doctoral thesis theme are brought together in the final table of results, characterized by theoretical and practical scientific relevance and actuality.

A number of main directions of research in the field will be added to them in the future.

The carried out scientific/doctoral research is an example of approach for the developers of strategies and programs, for decision-makers and managers, because the results and solutions are related to the effective alignments of resource use, to verified and validated criteria and conclusions for the Valea Jiului Carboniferous Basin and, in generally, for the mining extractive field.