Revista Minelor – Mining Revue
ISSN-L 1220-2053 / ISSN 2247-8590
vol. 30, issue 3 / 2024, pp. 106-110

IDENTIFICATION, DEFINITION AND PROPAGATION OF SYSTEMIC ELEMENTS OF INSTABILITY AND INSECURITY WITHIN THE NATIONAL MINING SYSTEM

Adrian Mihai ȘCHIOPU[1], Manuel Cristian SĂVULESCU[2], Florin MUREȘAN – GRECU[3], Gheorghe Eugen SAFTA[4], Emanuel Alin CRUCERU[5], Nicolae Daniel FÎȚĂ[6]*

[1]Strategic Studies of Energy Security European Center, Petrosani, Romania, schiopu.adrian.mihai@gmail.com
[2]University of Petrosani, Petrosani, Romania, savio_scm@yahoo.com
[3]University of Petrosani, Petrosani, Romania, flomavon2002@yahoo.com
[4]University of Petrosani, Petrosani, Romania, saftaeugen70@yahoo.com
[5]Strategic Studies of Energy Security European Center, Petrosani, Romania, România, alincruceru1988@gmail.com
[6]University of Petrosani, Petrosani, Romania, România, daniel.fita@yahoo.com

DOI: 10.2478/minrv-2024-0031

Abstract: *The National Mining System is one of the most important national systems because it provides the necessary coal (anthracite, hard coal, lignite, peat, etc.) to ensure the energy security of Romania, as well as fuel for the steel and cement industry. But as any national system is not one hundred percent secure, it is subject to elements of instability and insecurity that are quantified in dysfunctions, deficiencies and non-conformities, which are in fact the main sources of undesirable events with an insecurity effect. These system elements, dysfunctions, deficiencies and non-conformities, are the main sources of vulnerability generation, which can have disastrous effects that can cause energy and national crises. In this paper, the authors identified, defined and propagated all the systemic elements of instability and insecurity within the National Mining System.*
Keywords: *identification, definition, propagation, systemic elements, mining system*

1. Identification of systemic elements of instability and insecurity

Identify the following systemic elements of instability and insecurity as shown in *Figure 1:* [1] [2]

a) dysfunctions;
b) deficiencies;
c) non-conformities.

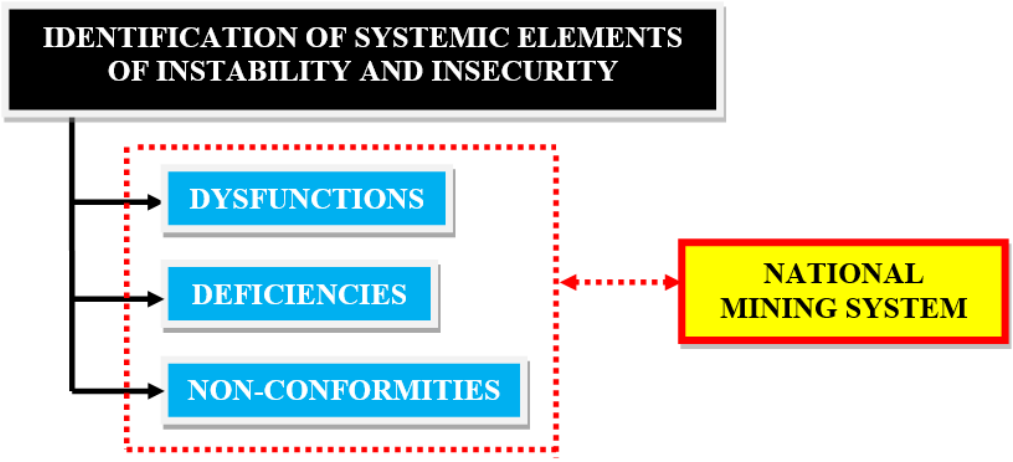

Fig. 1. Identification of systemic elements of instability and insecurity

* Corresponding author: Nicolae Daniel Fîță, lect. Ph.D. eng., University of Petrosani, Petrosani, Romania, Contact details: University of Petrosani, 20 University Street, daniel.fita@yahoo.com

1.1. Dysfunctions identified

Dysfunctions identified within the National Mining System, according to *table 1.:* [3] [4] [5]

Table 1. Dysfunctions identified within the National Mining System

Dysfunction identified	Vulnerability generated
1. Lack, precariousness or non-compliance with the activities of operation, maintenance and development of underground and/or surface mining facilities: • the lack, precariousness or non-compliance with operating procedures; • lack, precariousness or non-compliance with maintenance procedures; • lack, precariousness or non-compliance with development procedures.	1. Poor management of mining operator and mining facilities.
2. Lack, precariousness or non-compliance with the operational management activities of the National Mining System: • the lack, precariousness or non-compliance with dispatching procedures; • the lack or precariousness of investments in mining infrastructure; • the lack, precariousness or non-compliance with mining security procedures.	2. Poor management of operational management of the National Mining System.
3. Lack or precariousness of investment in mining infrastructure.	3. Instability and unsafe of the National Mining System caused by lack or precarious investments in mining infrastructure.
4. Lack, precariousness or non-compliance with the mining security activity within the National Mining System: • the lack, precariousness or non-compliance with mining security procedures; • non-performing infrastructure.	4. The precariousness of the Mining Security activity.
5. Lack, precariousness or non-compliance with Safety, Security and Occupational Health and Safety activity, from all places of work: • lack, precariousness or non-compliance with Safety, Security and Occupational Health and Safety procedures; • the lack, precariousness or non-compliance with electrical safety procedures; • the lack, precariousness or non-compliance with the assessment and audit in terms of Occupational Health and Safety; • lack, precariousness or non-compliance with the Prevention, Protection and Security Plan.	5. Precarity of Safety, Security and Occupational Health and Safety activity.
6. Lack, precariousness or non-compliance with the protection and security activity of critical infrastructures within the National Mining System: • lack, precariousness or non-compliance with Critical Infrastructure Protection procedures; • the lack, precariousness or non-compliance with the Operator's Security Plan; • lack, precariousness or non-compliance with physical security procedures; • the lack, precariousness or non-compliance with the strategy for the protection of national critical infrastructures regarding the National Mining System.	6. The precariousness of the protection and security activity of critical mining infrastructures.
7. Lack, precariousness or non-compliance with the development, safety and security strategies of the National Mining System: • the lack, precariousness or non-compliance with the development strategy regarding the National Mining System; • the lack, precariousness or non-compliance with the strategy of protection and security of critical infrastructures within the National Mining System; • the lack, precariousness or non-compliance with the energy security strategy of the National Mining System.	7. Lack of strategies for the development, critical infrastructure protection and mining security of the National Mining System.

1.2. Deficiencies identified

Deficiencies identified from the National Mining System according to *Table 2:* [3] [4] [5]

Table 2. Deficiencies identified within the National Mining System

Deficiencies identified	Vulnerability generated
1. Removing coal-fired capacities from production and increasing electricity consumption (coal-based).	1. Power deficit in the National Energy System.
2. A series of obsolete and technologically outdated mining installations, with high consumption and operating costs, causing very frequent defects, disturbances, damage and accidents at work.	2. Deficit of high performance mining installations in the National Mining System.
3. Lack of coal storage.	3. Deficit coal storage infrastructures.
4. Lack of financial measures to support mining projects and programs and lack of European funds for investments in modern mining infrastructure.	4. Deficit of mining financial resources.
5. Reduced research-development-dissemination capacity in mining energy sector.	5. Deficit of mining energy research and development resources.
6. Intervention of political factor or nepotism in mining.	6. Deficit of skilled and overqualified mining resource.
7. Possible thefts and sabotage from their own facilities.	7. Deficit of honest and serious human resources.
8. Political and legislative unpredictability.	8. Deficit of political and legislative stability.

1.3. Non-conformities identified

Non-conformities identified from the National Mining System, according to *Table 3:* [3] [4] [5]

Table 3. Non-conformities identified within the National Mining System

Non-conformities identified	Vulnerability generated
1. Unexpected disconnection of equipment and protective devices from mining exploitations.	1. Precarity and non-performance of mining equipment and appliances within the National Mining System.
2. Poor condition of mining equipment and appliances.	2. Lack of coal – possible local, area, regional or national blackout, stemming from the lack of coal-fired electricity.
3. Lack of coal-fired electricity from national systems.	3. Dependence of national systems on coal-fired electricity.

2. Definition of systemic elements of instability and insecurity

2.1. Dysfunction

Dysfunctions are those actions manifested by failures and/or disorders of the functions of the National Mining System, with the effect of reducing, integrating or adapting the infrastructure/installation, and not identifying, including, superficial treatment or poor management of dysfunctions automatically generates vulnerabilities, which can pay attention to Safety, Security and Occupational Health and Safety.

2.2. Deficiencies

Deficiencies are the lack of physical qualities manifested by defects or gaps and are characterized by deficit, and an infrastructure/installation within the National Mining System with deficiencies cannot operate at its normal parameters and urgent re-commissioning or resilience measures must be taken, for the purpose of preventing occupational accidents or illnesses.

2.3. Non-conformities

Non-conformities represent the failure to meet certain requirements of an infrastructure/installation within the National Mining System, manifested by the deviation of some characteristics from the requirements specified in the security plan or operating manual, and an infrastructure/installation with non-conformities cannot operate at its normal parameters and urgent measures must be taken to eliminate non-conformities in order to prevent occupational accidents or illnesses.

3. Propagation of systemic elements of instability and insecurity

The propagation of systemic elements of instability and insecurity in vulnerabilities is shown in *Fig. 2:* [5]

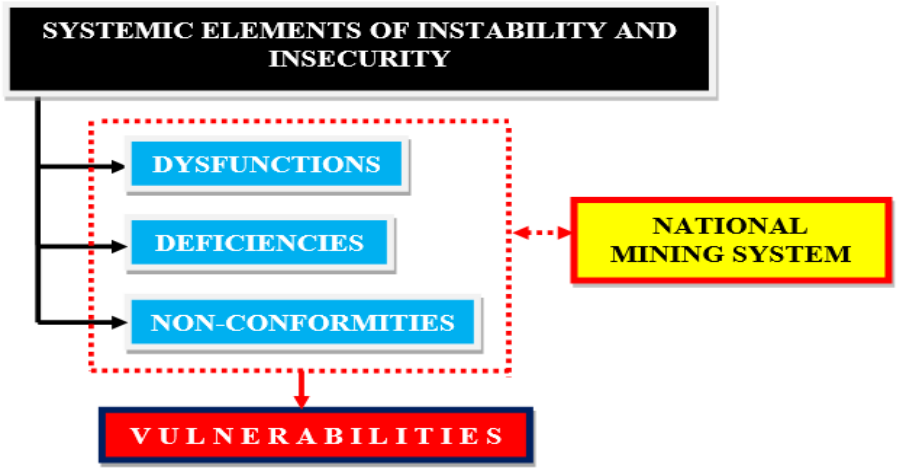

Fig. 2. Scheme of propagation of system elements in vulnerabilities

4. Conclusions

Following the analysis:

a) ***3 systemic elements of instability and insecurity*** were identified: *dysfunctions, deficiencies and non-conformities;*

b) ***7 Dysfunctions*** were identified: *Lack, precariousness or non-compliance with the activities of operation, maintenance and development of underground and/or surface mining facilities (the lack, precariousness or non-compliance with operating procedures, lack, precariousness or non-compliance with maintenance procedures, lack, precariousness or non-compliance with development procedures); Lack, precariousness or non-compliance with the operational management activities of the National Mining System (the lack, precariousness or non-compliance with dispatching procedures, the lack or precariousness of investments in mining infrastructure, the lack, precariousness or non-compliance with mining security procedures; Lack or precariousness of investment in mining infrastructure; Lack, precariousness or non-compliance with the mining security activity within the National Mining System (the lack, precariousness or non-compliance with mining security procedures, non-performing infrastructure; Lack, precariousness or non-compliance with Safety, Security and Occupational Health and Safety activity, from all places of work (lack, precariousness or non-compliance with Safety, Security and Occupational Health and Safety procedures, the lack, precariousness or non-compliance with electrical safety procedures, the lack, precariousness or non-compliance with the assessment and audit in terms of Occupational Health and Safety, lack, precariousness or non-compliance with the Prevention, Protection and Security Plan; Lack, precariousness or non-compliance with the protection and security activity of critical infrastructures within the National Mining System (lack, precariousness or non-compliance with Critical Infrastructure Protection procedures, the lack, precariousness or non-compliance with the Operator's Security Plan, lack, precariousness or non-compliance with physical security procedures, the lack, precariousness or non-compliance with the strategy for the protection of national critical infrastructures regarding the National Mining System; Lack, precariousness or non-compliance with the development, safety and security strategies of the National Mining System (the lack, precariousness or non-compliance with the development strategy regarding the National Mining System, the lack, precariousness or non-compliance with the strategy of protection and security of critical infrastructures within the National Mining System, the lack, precariousness or non-compliance with the energy security strategy of the National Mining System;*

c) ***Deficiencies*** were identified: *Removing coal-fired capacities from production and increasing electricity consumption (coal-based); A series of obsolete and technologically outdated mining installations, with high consumption and operating costs, causing very frequent defects, disturbances, damage and accidents at work; Lack of coal storage; Lack of financial measures to support mining projects and programs and lack of European funds for investments in modern mining infrastructure; Reduced research-development-dissemination capacity in mining energy sector; Intervention of political factor or nepotism in mining; Possible thefts and sabotage from their own facilities; Political and legislative unpredictability;*

d) ***3 Non-conformities*** were identified: *Unexpected disconnection of equipment and protective devices from mining exploitations; Poor condition of mining equipment and appliances; Lack of coal-fired electricity from national systems.*

Following the identification of the systemic elements of instability and insecurity and the deep analysis of dysfunctions, deficiencies and non-conformities, the vulnerabilities of the National Mining System are automatically generated. Knowing the vulnerabilities caused by the systemic elements of instability and insecurity, following the analysis and evaluation, the related risks can be automatically identified and evaluated.

References

[1] **Covaci Ș.**, 1983
Underground Mining, Volume I, Didactic and Pedagogical Publishing House, Bucharest

[2] **Covaci Ș., et al.**, 1999
Underground Mining, Volume II, Corvin Publishing House, Deva

[3] **Preda G., Marinescu M., Năstase G.**, 2004
Harnessing Natural Resources – Volume I – Basics of Natural Resources, International University Press Publishing, ISBN: 973-99374-5-4, Bucharest.

[4] **Băhnăreanu C.**, 2008
Energy Security, Defense and Security Strategic Studies Center, "Carol I" National Defense University Publishing House, Bucharest

[5] **Fîţă N.D., et al.**, 2021
Occupational Health and Safety Management, An Important Pillar of National Security from Romania, International Conference on Electrical, Computer and Energy Technologies (ICECET), Cape Town, South Africa, pp. 1-5, doi: 10.1109/ICECET52533.2021.9698802.