

VISION ZERO – Tools for Safety, Health, and Well-being Management and the Application in the Vietnamese Coal Mining Industry

NGUYEN Nga^{1,*}, MEESMANN Ulrich², TRUONG Ngoc-Linh³, TRINH Vu-Hoa⁴

¹ Hanoi University of Mining and Geology, Department of Mining Management, Hanoi, Vietnam, International Social Security Association – Prevention in Mining (ISSA Mining)

² Association for Raw Materials and Chemical Industry (BG RCI), Bochum, Germany, ISSA Mining

³ Ha Lam Coal Joint Stock Company, Halong, Quang Ninh, Vietnam

⁴ Duong Huy Coal Company, Campha, Quang Ninh, Vietnam

Corresponding author: nguyenthihoinga@humg.edu.vn

Abstract. The Vietnamese mining industry is one of the most dangerous industries in the country. Mining companies understand safety and health for sustainable development at the mining sector and the national level. Thus, they have been applying many measures to improve their safety and health management achievements. Besides technology measures, organizational and personal measures are priorities. At the international level, VISION ZERO is a global movement based on the belief that all accidents, diseases, and harm at work are preventable. VISION ZERO develops its Seven Golden Rules to guide leaders, managers, and workers to create a safe and healthy working environment for the well-being of employees. The paper focuses on VISION ZERO, its theoretical aspects, and the application process in the Vietnamese coal mining companies.

Keywords: Vision Zero, Safety and health, Vietnamese coal mining industry

1. Introduction

VISION ZERO (VZ) is a transformational approach to prevention that integrates the three dimensions of safety, health, and well-being at all levels of work [1]. In June 2015, all thirteen prevention sections of the International Social Security Association (ISSA) decided to adapt the VISION ZERO prevention strategy and the Seven Golden Rules as the harmonized tools to reach the aim of zero harm, in all sectors of industry across the globe. Today, many resources have been developing to support the VZ campaign and promote it worldwide. Besides PowerPoints, videos, articles, App, tools like the 7 Golden Rules, and Guides can be widely used for leaders and managers in companies. The mining industry worldwide is benefiting from VZ, and its guiding documents, which mining companies in Chile, Germany, Pakistan, Peru, Thailand, Zambia, etc., are examples. As of 2019, 1100 companies, partners, and trainers are engaging in VZ. In Vietnam, the mining industry is a pillar of the economy regarding its contribution to other manufacturing industries, a significant taxpayer, and a big employer. However, the Vietnamese mining industry is also facing safety and health management problems when the production conditions become complicated, the acceptance of society to an industry with images of danger, negative impacts on the environment, and solutions to protect the climate change, and reduce cultivation areas [2]. Therefore, for the sustainable development of the nation and the mining sector, besides economic benefits, environmental protection, safety, and social acceptance are significant. Fortunately, safety, health, and well-being of labor are now priorities in the general strategic development of Viet Nam to 2045, as stated in the Resolution of the Party Congress in 2021. Thus, a focus on Vision Zero and the application in the Vietnamese mining industry becomes very helpful.

2. Study objectives and areas

Vision Zero and its documents, especially the Seven Golden Rules are objectives in the theoretical part of the paper.

The Seven Golden Rules for Vision Zero are as follows:

1. Take leadership – demonstrate commitment
2. Identify hazards – control risks
3. Define targets – develop programs
4. Ensure a safe and healthy system – be well-organized
5. Ensure safety and health in machines, equipment, and workplaces

6. Improve qualifications – develop competence

7. Invest in people – motivate by participation

These golden rules are developed by various questions with three rates of (1) action required, (2) room for improvement, and (3) fully implemented so that leaders, managers, and other employees can use them as a checklist to see how things look in their companies. The Seven Golden Rules contain 23 statements, under which 110 questions are used for the evaluation [3].

Ha Lam Coal Mining Company is in Halong City, and Duong Huy Coal Mining Company is in Cam Pha City, Quang Ninh. Ha Lam Coal Mining Company (HLC) was founded in 1950, and today it is one of the forerunners in the coal mining industry regarding the innovation of technology to meet the demand of deeper excavation in a vertical shaft, safety, and health culture, and quantity of output and profit from the production. HLC has been employing more than 3,100 people. From 2015 – 2019, there were 132 accidents happened, causing three deaths [4]. The annual production of HLC is approximately 2.5 million tons in the last five years. Duong Huy Coal Mining Company (DHC) was established more than 40 years ago. Recently, the annual output is more than two million tons. DHC is a big employer in the area with over 3,400 employees. Despite many safety management measures, during 2016 – 2020, there were 310 people have been suffering from serious and minor accidents, of which are eight fatalities [5]. The two companies are implementing modern technology in their excavation to improve safety. Consequently, there are also adjustments in the organization and labor force.

In HLC, the Seven Golden Rules were adjusted to evaluate the safety culture of the company in 2020. These rules once again were modified to survey the safety and health management in DHC in 2021.

Besides, a few training activities for staff and middle-level managers of the coal mining companies and mining engineering students about VZ and the Seven Golden Rules from 2017 to 2020 are also research objectives.

3. Materials and Methods

3.1 Documents and guidelines about Vision Zero

Vision Zero has offered resources for people who wants to use VZ as a helpful tool in companies, such as the Seven Golden Rules and guides, Powerpoints, videos, visual identity, articles, proactive leading indicators, app, and resources produced by VZ supporters [6]. There are several guidelines for mining industry, which is developed by the International Social Security Association – Prevention in Mining [3], seeing if in a mining company how the safety, health, and well-being are implemented, or if there is a need for improvement, or whether it needs to take corrective action.

Golden rule 1: Take leadership – demonstrate commitment: Safety and health are not only duties of the executive or a manager, or an employee, but of the whole company's system. However, the safety competence of companies' leaders is significant, so are leader skills regarding communication, management culture and role models. Thus, a good leader with demonstrate commitments about safety is a decisive factor for the success or failure of safety and health in a mining company

Golden rule 2: Identify hazards – control risks: Risks cannot be controlled if they are not fully identified. Once hazards are identified, the assessment of risks' damages and losses, either visible or invisible, or time is more precise. Accidents, injuries and near misses should also be recorded.

Golden rule 3: Define targets – develop programs: Success in occupational safety and health requires clear goals and concrete steps for implementaion, which should be established in a program. In another words, plans for safety management in short-term, midium-term and long-term are important to utilize the companies' resources.

Golden rule 4: Ensure a safe and healthy system – be well-organized: To implement this rule, leaders should understand the advantages of an adequate and a systematic occupational safety and health organization. As disruptions, production downtime and other quality issues can be protected with the system, productivity can be increased and the companies can be more profitable.

Golden rule 5: Ensure safety and health in machines, equipment, and workplaces: Safe production includes all technical, organizational and personal measures, in which technical issues should be first improved. Although companies cannot use the latest technology most of the time, when they can maintain the newest occupational and health standards, the companies' employees, assets, and images can be protected.

Golden rule 6: Improve qualifications – develop competence: This rule requires the understanding of investment in the training and skills of employees is bringing the readiness of knowledge and competence for the workers, managers and leaders of the companies.

Golden rule 7: Invest in people – motivate by participation: This rule relates to the leadership and the role model of the leader to engage their employees talk openly about risks and hazards, and the employees feel that they are part of the safety strategy and safety culture.

Tab. 1. The Seven Golden Rules to implement VISION ZERO.

Rule	Statement (Scale)	Number of breakdown categories
Rule 1: Take leadership – demonstrate commitment	I demonstrate safety and health, set the standards, and serve as a role model for the employees and managers	6
	The importance of safety and health is known to everyone in my enterprise – and we talk about it openly	5
	I act consistently and demonstrate the importance of safety and health at work	4
	I invest in safety and health in the enterprise	4
Rule 2: Identify hazards – control risks	I make sure that a risk assessment is prepared in my enterprise, documented, and updated at regular intervals	6
	Occupational accidents, near misses and critical incidents are reported, recorded statistically, and evaluated to determine the potential for improvements	6
	We use the insights gained from the risk assessment and from accident analysis to make improvements	3
Rule 3: Define targets – develop programs	I have established clear goals for safety and health	4
	I plan concrete activities to reach my goals	4
	I establish performance figures to verify the effectiveness of my measures	5
Rule 4: Ensure a safe and healthy system – be well-organized	Structure, responsibilities, competencies, procedures and processes – my enterprise is well-organized in regard to occupational safety and health	7
	Safety and health in the enterprise is an important factor when filling management positions	5
	The organization of safety and health in my enterprise meets the applicable legal requirements as a minimum	9
Rule 5: Ensure safety and health in machines, equipment, and workplaces	We make sure that the current safety standards are met in the construction and/or procurement of new production facilities, machines, and equipment, and in the design of workplaces	5
	In the daily operation of production facilities, machines, and equipment, I make sure that the safety devices work reliably and are used	6
	We make sure that our production facilities, machines, and equipment do not pose any health hazards, and that these are minimized	3
Rule 6: Improve qualifications – develop competence	We know what qualifications and competencies we need for the safe and healthy operation of our production technology and to avoid disruption	4
	I invest in the systematic training and continuing education of my employees and also support their personal further development	4
	I put the expanded or new competencies of my employees to use and assign them suitable new responsibilities	3

	Knowledge leads to safety – which is why I highly value practical, comprehensible instructions for the employees	3
Rule 7: Invest in people – motivate by participation	I demonstrate my personal appreciation to the employees, I also expect this from all managers and senior staff	3
	I use the topics of safety and health at work for the establishment and further development of a positive company culture	5
	In our enterprise, we have established structures that are helpful for participation and motivation	6

3.2 Data collection from HLC and DHC

Both HLC and DHC comply regulations from the authorities regarding occupational safety and health (OSH) structures, issuing internal OSH regulations and guidelines, collecting and storing statistic data, conducting regular reports, training, practicing etc.

At HLC, safety culture was established throughout the years by many regulations, campaigns and activities. Besides, HLC is also the first coal company of Vietnam that proposed a safety strategy to 2025, concentrating on improving leadership and organization in OSH, assuring the safety management effects by investment in technology innovation, upgrading safety training and creating rewards and sanctions in safety management, reducing numbers of incidents, accidents, and death tolls. At top managers level, HLC ensure the implementation of technology renovation in OSH, with strong commitments about safety. At the middle managers level, statistic data about OSH, including near-missed incidents and accidents are fully recorded, which are much helpful to mitigate risks. In 2020, HLC also assessed its safety culture under the consultation of an ISSA Mining expert to recommendate solutions for better safety culture and safety competence for the staff and workers of the company [4]. VZ checklist (Tab. 1.) was modified to a questionnaire with some open-ended questions, getting to know the safety competence of the interviewees, and 7 golden rules with various scales. The following categories are the focus of the survey: Role model, Responsibility, Standards and benchmarks establishment, Monitoring, Motivation, Discussion, Compliance (Rule 1), Forecasting, Recording and Communication, Evaluation and Investigation (Rule 2), Company targets and personal goals, Instruction, (concrete) Plans to achieve targets (Rule 3), Safety organization, Safety procedure, Monitoring and early warning system, Safety legal regulation (Rule 4), Safety machines and equipment, Safety production, Safety workplaces (Rule 5), Design safety programs, Training, Training effects (Rule 6), Payrolls and rewards scheme, Spiritual motivation (Rule 7). The survey was applied to 4 focus groups of leaders and managers (42 scales), officer staff (46 scales), foremen (46 scales), and workers (46 scales). Of the 483 correspondents, 373 handed completed questionnaires. The data collection process was exclusively conducted and administered by the researchers throughout the implementation period of this research study, which took practically 3 months - from beginning of March 2020 to end of May 2020.

All scales were scored on a 3-point Likert-type format from (1) action required – 1 point, (2) room for improvement – 2 points and (3) fully implemented – 3 points. The checklist transferred to participants in Vietnamese. Surveying questionnaires were sent to participants via the hard copy version.

At DHC, the Seven Golden Rules was applied in March and April 2021 to evaluate the current situation of OSH management. The focus groups are safety managers (middle and first-line) and safety staff, and workers. The questionnaire includes also open-ended questions, aiming to understand the current situation OSH, evaluating OSH measures of DHC, identifying risks and hazards, and collecting appropriate safety measures. Of the 500 correspondents, 472 handed completed questionnaires. The scales were scored on a 5-point Likert scale from (1) Strongly disagree to (5) Strongly agree. The scale concentrated on legal – policies, technology, organization, personal and leadership. The checklist also transferred to participants in Vietnamese. Surveying questionnaires were sent to participants via the hard copy version.

Both in HCL and DHC the distribution of interviewees regarding ages and seniorities are of reliable and precise evaluation.

Tables 2 and 3 describes the sample information after collected and processed in HLC and DHC, respectively.

Tab. 2. Distribution of sample by title in HLC, 2020.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Leaders and department managers	26	6.97	6.97	6.97
	Department officers	86	23.06	23.06	30.03
	Foremen	36	9.65	9.65	39.95
	Workers	225	60.32	60.32	100.0
	Total	373	100.0	100.0	

Tab. 3. Distribution of sample by title in DHC, 2021.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Middle and first-line managers	93	24.54	24.54	24.54
	Workers	379	75.46	75.46	100.0
	Total	472	100.0	100.0	

3.3 Methods

Authors organized surveys and group discussions in HLC and DHC. All scales Observation happened in training activities of VZ and the Seven Golden Rules to staff (approximately 100 persons) for coal mining companies in the Vietnam National Coal – Minerals Holding Corporation Limited (Vinacomin), the representative of the Vietnamese mining industry.

From the questionnaire responses, descriptive statistics were used to identify reality of safety culture and management in HLC and DHC.

The collected data was then analyzed using SPSS 20 to obtain Minimum, Maximum, and Mean.

4. Results and discussions

Generally, the foremen of HLC highly evaluated the OSH management with 2.934. The lowest point comes from workers with 2.705. This number shows that the OSH management in HLC still needs improvement. Table 4. Show results of safety culture in HLC following the checklist from VZ golden rules.

Tab. 4. Results of safety culture in HLC.

Rule	Leaders and managers		Department officers		Foremen		Workers	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Total	2.712		2.896		2.934		2.705	
Rule 1: Take leadership – demonstrate commitment	2.669	5	2.903	2	2.938	4	2.743	2
Rule 2: Identify hazards – control risks	2.715	3	2.902	3	2.897	6	2.738	3
Rule 3: Define targets – develop programs	2.746	2	2.899	4	2.901	5	2.712	5
Rule 4: Ensure a safe and healthy system – be well-organized	2.669	5	2.887	6	2.889	7	2.717	4

Rule 5: Ensure safety and health in machines, equipment, and workplaces	2.762	1	2.935	1	2.972	2	2.633	6
Rule 6: Improve qualifications – develop competence	2.646	7	2.853	7	2.978	1	2.774	1
Rule 7: Invest in people – motivate by participation	2.692	4	2.893	5	2.961	3	2.588	7

Although safety culture is an essential aspect of HLC in their safety strategy, the evaluation differs among each focus group. From the point of view of leaders and managers, as well as department officers of HLC, the company have been invested in safety machines and equipment. They also build and maintain a safety and healthy working environment for the employees, especially workers underground (Rule 5). The leaders of the company can have a close look into their leadership and commitment, understanding that they must do more to maintain and increase the leadership effects in OSH at the company (Rule 1). So do the foremen, who are the leaders onsite. From that understanding, following the advice from ISSA Mining experts, top leaders of HLC raise the awareness of leadership and commitment in safety by the slogan: Safety is moral, our employees are the first and foremost. This commitment is nowadays the strongest commitment in the Vietnamese mining industry ever.

The foremen and workers of HLC through the questionnaires think that they are well trained to adapt to the production. However, the leaders and managers, as well as the department officers in HLC recognized that they must improve in the Rule 6 Improve qualifications – develop competence, especially in the training for employees to prepare a skillful labor force with high safety competence to meet the demand of their production in the future. Based on the evaluation from the workers’ views, HLC issued its guidelines to comply Rule 5 Ensure safety and health in machines, equipment, and workplaces for their staff and workers in the beginning of 2021.

Regarding the Rule 7, despite the understanding of the importance of the labor force from the leaders, payrolls and rewards scheme and spiritual motivation for workers at HLC still require better improvement. The evaluation from 205 workers (60.32% of interviewees) is the lowest point in the whole survey at HLC.

In DHC, the Seven Golden Rules was developed to 31 scales for managers and 28 scales for workers. Tables 5 and 6 shows the top 5 and bottom 5 results of OSH management in DHC, evaluated by managers and workers, respectively.

Tab. 5. Results of the OSH management in DHC by managers (top 5 and bottom 5).

Scale	N	Minimum	Maximum	Mean
You always comply with OSH regulations	93	3.0	5.0	4.505
You always promote OSH for other employees	93	1.0	5.0	4.495
Your company regularly updates OSH regulations and policies from the government and authorities, specifying to the internal ones	93	1.0	5.0	4.484
You always remind your colleagues about OSH at short meetings before shifts start	93	1.0	5.0	4.484
You are the role model to other colleagues regarding OSH	93	2.0	5.0	4.452
...		.		
Departments and production units have good connection and communication for OSH	93	2.0	5.0	4.043

You understand well the OSH regulations	93	2.0	5.0	4.032
Employees of DHC always comply OSH regulations	93	1.0	5.0	4.032
Employees of DHC always improve their competence and skills for better OSH	93	1.0	5.0	3.978
Machines and equipment are always maintained and prepared in time to ensure OSH	93	2.0	5.0	3.978

Tab. 6. Results of the OSH management in DHC by workers (top 5 and bottom 5).

Scale	N	Minimum	Maximum	Mean
Talking about OSH is always a topic of short meetings before shift start	379	1.0	5.0	4.492
You are always communicated about OSH	379	2.0	5.0	4.347
You are usually trained and coached about OSH	379	1.0	5.0	4.347
DHC built appropriate sanctions for people who cause unsafety	379	2.0	5.0	4.329
You always want to improve your competence and skills for better OSH at your production units	379	1.0	5.0	4.310
...		.		
PPE is in good conditions and ready to use	379	1.0	5.0	4.077
Equipment to fix incidents always function well	379	1.0	5.0	4.021
You understand well the OSH regulations	379	2.0	5.0	4.016
Machines and equipment are always maintained and prepared in time to ensure OSH	379	1.0	5.0	4.005
Your production unit is always equipped in time to fix incidents	379	1.0	5.0	3.995

The managers of DHC recognized that they must comply with OSH regulations and promote OSH for other employees of the company. However, it seems sometimes they did not understand well the OSH regulations (one of bottom 5) and this situation needs to be improve. To managers, leadership and its role were practiced better at DHC, but it still needs to develop ensure safety and health in machines and equipment and workplaces, as well as improve capacity of workers, regarding the bottom 5 with the lowest points. To workers, leadership, identify hazards to control risks, and improve capacity of employees were implemented well in DHC, meanwhile ensure safety and health in machines and equipment and workplaces still had room to improve. DHC is now conducting its action plans to improve OSH with a strong commitment from the leaders to reduce 20 – 25 % accidents of the company in comparison to previous years. They expect the results of improving productivity and benefits both for DHC and the employees. Their solutions concentrate on technology renovation, organizational reform and personal OSH programs.

Training activities with VZ documents and resources have been applying for reserve directors, middle managers, first-line managers, etc. in mining and auxiliary companies of Vinacomin since 2019. By participatory training methods, such as group discussion, teamwork, etc. learners can easily form knowledge and skills. Using OSH clips as a resource of VZ help learners increase their ability to remember. Observations from Wrap-ups and Feedback sessions of trainings show their evaluation that learners are more motivated, improving their awareness of OSH, respecting skillful workers and their roles in mining coal company, and the precious asset of a company is the labor force.



Fig. 1. Resources of ISSA Mining used in an OSH training to staff of Cua Ong Coal Processing Company in 2019 (Photo/Trainer: NGUYEN, Nga).

5. Conclusions

Generally, VISION ZERO and the Seven Golden Rules is gradually introduced into coal mining companies in Vietnam at different level of training for awareness, implementation the rules and development into various activities such as designing handbooks and guidelines at mines. Pilot programs in Ha Lam Coal Joint Stock Company and Duong Huy Coal Company show the possibility of the Seven Golden Rules' application widely in the Vietnamese coal mining industry, regardless production conditions and cultural aspects. Coal mining companies can also use scales of the Seven Golden Rules and broaden the Linkert scales, besides using statistic numbers, to evaluate in a period for better understanding about the OSH improvement.

6. Acknowledgments

The paper was presented during the 6th VIET - POL International Conference Scientific-Research Cooperation between Vietnam and Poland, 10-14.11.2021, HUMG, Hanoi, Vietnam.

The authors are thankful to colleagues of the International Social Security Association – Prevention in Mining, the Mining Management Department of HUMG and coal mining companies of Vinacomin for their supports and cooperation.

7. References

1. <https://visionzero.global/resources>, 19/05/2021
2. Nguyen, N., 2020. A review of social license to operate in Southeast Asian mining, *The Extractive Industries and Society*, 8(2), <https://doi.org/10.1016/j.exis.2020.11.007>
3. <https://visionzero.global/sites/default/files/2017-12/2-Vision%20Zero%20Guide-Web.pdf>, 19/5/2021
4. <https://halamcoal.com.vn/>, 19/5/2021
5. <http://thanduonghuy.com.vn/>, 19/5/2021
6. <https://visionzero.global/guides>, 19/5/2021