Analysis of Indonesia Mineral and Coal Mining Safety Management System Policy Using Soft System Methodology

Yudo Anggoro* and Dean Andreas Simorangkir

School of Business and Management, Institut Teknologi Bandung

Abstract. *After 3 years the Ministry of Energy and Mineral Resources Regulation (MEMR) No. 38 of 2014 on Mineral and Coal Mining Safety Management System was published, Mining Companies in Indonesia are still having difficulties in applying this regulation. In this study, the gap between the current and the expected condition are quantified, the causes are described, and strategies to improve the situation are developed by using Soft System Methodology. The population of this study is limited to mining companies whose permits are granted by MEMR. The results of evaluation showed that only 41% had achieved the expected level, as for now there are many barriers including: 1) Internal Factor: lack of understanding, management support and unstable workforce; 2) Difficulties in managing service companies); 3) Nature of Company: lack of resources, lack of familiarity with system concept); 4) Poor Audit; and 5) Lack of information from Government. This policy should be continued. The Government Interventions should be taken, including: 1) Promotion to Top Level Management; 2) Competency Development for Mine Inspector and Mining Companies; 3) Setting Minimum Criteria for Service Companies; 4) Optimizing the Audit; 6) Supervision; 7) Safety Award; 7) Strict Sanctions; 8) Increasing Awareness and Recognition.*

Keywords: *Mining, occupational health and safety management, public policy evaluation, soft system methodology, system thinking*

Abstrak. *Setelah tiga tahun Peraturan Menteri Energi dan Sumber Daya Mineral Nomor 38 Tahun 2014 tentang Penerapan Sistem Manajemen Keselamatan Pertambangan Mineral dan Batubara, Perusahaan Pertambangan masih mengalami kesulitan dalam menerapkannya. Dalam studi ini, kesenjangan antara kondisi saat ini dan yang diharapkan diukur, penyebab kesenjangan dijelaskan, dan strategi untuk memperbaiki situasi dikembangkan dengan Soft System Methodology. Penelitian ini terbatas pada perusahaan pertambangan yang izinnya diterbitkan oleh Kementerian ESDM. Hasil evaluasi menunjukkan bahwa hanya 41% perusahaan yang telah mencapai tingkat penerapan yang diharapkan, dimana terdapat banyak kendala implementasi, antara lain: 1) Faktor Internal Perusahaan: kurangnya pemahaman, dukungan manajemen, dan tidak tetapnya tenaga kerja; 2) Kesulitan dalam mengelola perusahaan jasa penambangan); 3) Sifat Perusahaan: kurangnya sumber daya, kurang terbiasa dengan konsep sistem; 4) Tidak optimalnya pelaksanaan audit: dan 5) Kurangnya informasi dari program pemerintah. Secara umum, kebijakan ini memiliki tujuan baik dan harus dilanjutkan. Intervensi Pemerintah yang harus diambil untuk memperbaiki situasi, antara lain: 1) Sosialisasi kepada Manajemen Tingkat Puncak Perusahaan; 2) Pengembangan Kompetensi untuk Inspektur Tambang dan Perusahaan; 3) Penetapan Kriteria Minimal Implementasi untuk Perusahaan Jasa; 5) Optimalisasi Fungsi Audit; 6) Pengawasan; 7) Inovasi untuk Safety Award; 8) Pemberian Sanksi Tegas; 9) Peningkatan Kesadaran dan Pengakuan.*

Kata kunci: *Evaluasi kebijakan publik, keselamatan dan kesehatan kerja, pertambangan, soft system methodology, system thinking*

Introduction

Occupational Health and Safety (OHS) as an aspect of Good Mining Practices in the mineral and coal mining sub-sector in Indonesia is managed by The Government of the Republic of Indonesia (GOI), represented by Directorate of Technical and Environmental of Mineral and Coal (DTEMC) of Ministry of Energy and Mineral Resources (MEMR). In the recent past the Indonesian mining industry has witnessed a numbers of fatalities occurring at mine sites. According to the MEMR (2017), 146 mine workers were fatally injured in accidents at mine sites in the last five years.

However, it doesn't mean that mining activities have to be unsafe. With the introduction of strict safety legislation, MEMR encouraged Mining Companies to adopt best practices to create favorable conditions for sustainable mining. Recently in 2014 the MEMR issued MEMR Regulation Number 38 of 2014 on the Implementation of Mineral and Coal Mining Safety Management System, which referred to Bahasa Indonesia as *Sistem Manajemen Keselamatan Pertambangan* (SMKP Minerba), with the main objective of enhancing the effectiveness of planned, measurable, structured, and integrated Mining Safety Management. All mining companies and mining service companies are obligated to apply SMKP Minerba in 1 year.

In 1986, after the 10 year study across all DuPont sites, DuPont stated that all accidents are preventable, considering 96 percent of injuries resulted from "unsafe acts" and "poor work practices" and another 4 percent due to other preventable causes. Since workplace injuries are preventable, in order to realize zero injuries, an organization must create an Occupational Health and Safety Management System (OHSMS). According to Gallagher (2000) OHSMS is defined as "A combination of planning and review, the management organizational arrangement, the consultative arrangement, and specific program elements that work together in an integrated way to improve health and safety at work." (Gallagher, 2000:1).

OHSMS emerged as a key prevention strategy in the mid-1980s. The Bhopal disaster is credited as the catalyst for attention to management systems in the process industries (Sweeney, 1992).

The International Organization for Standardization (ISO) considered developing an international management standard for OHS, similar to those already established for quality (ISO 9001) and the environment (ISO 14001). Companies also sought certification to an ISO-compatible OHS standard. The British Standards Institute developed OHSAS 18001 to response this demand. This standard was internationally recognized and then adopted by industries as a proxy for an ISO standard. According to DuPont, there are many benefits of implementing OHSMS, including: potential lowers workers compensation cost, increased productivity, increased moral, lower absenteeism, and increased compliance (DuPont, 1986). ILO also stated that the establishment of OHSMS is the most efficient way to build a sustained safety culture.

The growing use of OHSMS also stems from public policy. Whilst in Europe such policy interventions span both mandatory and voluntary approaches, Australian state and territory governments have focused more on the latter (Gallagher, 2001). In Indonesia, SMKP Minerba method of implementation is mandatory, as legislative requirement for Mining Companies.

As a public policy, SMKP Minerba also cannot be taken away without evaluation. J.E Anderson (2003) viewed policy process as a cycle or sequential pattern of functional activities (Anderson, 2003). He developed framework of policy process which identified stages for any policy domain: (1) problem identification and agenda setting; (2) policy formulation; (3) policy adoption; (4) policy implementation; and (5) policy evaluation. The final phase is evaluation. According to Anderson, the public policy evaluation involves the estimation, appraisal, or assessment of a policy including its content,

implementation, goal attainment and other effects (Anderson, 1979). Sapru (2011) stated that policy evaluation is used for one or more of three purposes of assessing policy efficiency, policy effectiveness, and policy impact. Policy evaluation is needed to see the gap between expectations and reality, and also to identify factors that contributed to the success or failure of a policy. It is very important as a form of accountability of the government for its performance.

As an OHSMS, based on existing OHSMS theories, SMKP Minerba is believed to be the best defense against workplace injuries. However, after 3 years SMKP Minerba Regulation was published, the effectiveness of SMKP Minerba implementation is still remained to be seen, as it was found that Mining Companies are still having difficulties in applying SMKP Minerba, and the lagging indicator, in form of rate of accidents and occupational diseases, showed that there has been no notable improvement in the mining OHS performance in general in Indonesia.

The assessment of the previous studies shows that there is no published study that has determined the effectiveness of this OHSMS implementation in Indonesia. Previously, there are some studies which assessed OHSMS effectiveness. Most of the distinguished the characteristics of firms with better OHS performance, and provide a range of findings on the variables associated with successful OHS outcomes.

Most research has been conducted in the USA, Britain and Scandinavia. In the late 1970s, a three-stage study by researchers at the U.S. National Institute of Occupational Safety and Health (NIOSH) to define the distinguishing features of firms with better health and safety performance. In the first two phases, matched pair comparisons were undertaken of safety program practices in firms with low and high injury rates (Cohen et al., 1975; Smith et al., 1978). The third phase examined the health and safety programs of five companies with exemplary OHS performance (Cohen & Cleveland, 1983).

In 1977, Simonds & Shafai-Sahrai evaluated factors apparently affecting injury frequency in eleven matched pairs of companies (Simonds & Shafai-Sahrai, 1977). Walters (1998:324) conducted studies which stress the importance of trade union support for worker representation in OHS. There are also some studies related to the effectiveness of the Scandinavian 'internal control' initiatives, such as Hovden and Tinmannsvik (1990:29) study which assessed condition for successful implementation of internal control. Given the likely significance of cultural variables (relating to management and employee behaviour), it is open to question whether findings for these countries would necessarily apply to Indonesian Mining industry.

Moreover, most studies are small scale and do not permit reliable generalisation. In 2000, Hopkins' analysis of the Esso gas plant disaster provides a thorough case study of how deficient management commitment can cause an OHSMS to fail in practice (Hopkins, 2000). In the same year, Pearse conducted study on an intervention project among small fabricated metal product companies in South Western Sydney (Pearse, 2000). The study by Gallagher (2000) of the relationship between OHSMS type and system performance is the only major large-scale study of OHSMS effectiveness in Australia.

This study would like to evaluate objectively the effectiveness of SMKP Minerba implementation as OHSMS and public policy in Indonesia, so the result of this study can be a feedback for MEMR for improving the intervention in the future. The general objective of this study is to evaluate of the Implementation of MEMR Regulation Number 38 of 2014 on Implementation of Mineral and Coal Mining Safety Management System and to determine the area of improvement for that policy to deliver more benefit for the Indonesian Mining Industry. The specific objectives of this study are to view the achievement of SMKP Minerba implementation in Mining Companies; to understand the real issues causing the barrier in

the implementation of SMKP Minerba Regulation, and to propose a recommendation to the leader within the DTEMC, in order to solve the issues.

Research Methodology

In order to answer the proposed research questions, the researcher develop Research Framework as seen on Figure 2.

The study is conducted using Mixed-Method - Sequential Explanatory Design (Creswell, 2007), which implies collecting and analyzing quantitative data in first stage and then collecting and analyzing qualitative data in the second stage, to strengthen the results. At first quantitative surveys are conducted to facilitate qualitative research at a later stage.
Quantitative surveys were conducted with collecting and analyzing dataset from MEMR related to Internal Audit Report and from the questionnaires that distributed to 95 mining companies in Indonesia.

The respondents are Mining Technical Managers (referred to Bahasa Indonesia as *Kepala Teknik Tambang – KTT*) of Mining Companies. The population in this study as set on the Research Limitation is 118 mining companies. This study used Slovin's Formula of Sampling to ensure the accuracy of results. The value of margin of error is set at 4.6%, so the sample size for this questionnaire is calculated as 95 mining companies. The Validation and Reliability of Questionnaires are tested by using IBM SPSS 24.

The result of surveys aims to get the portrait of the gap between the condition of SMKP Minerba implementation on Indonesia mineral and coal mining with the expected condition. The result of quantitative surveys will provide good measurement of several factors of the issue.
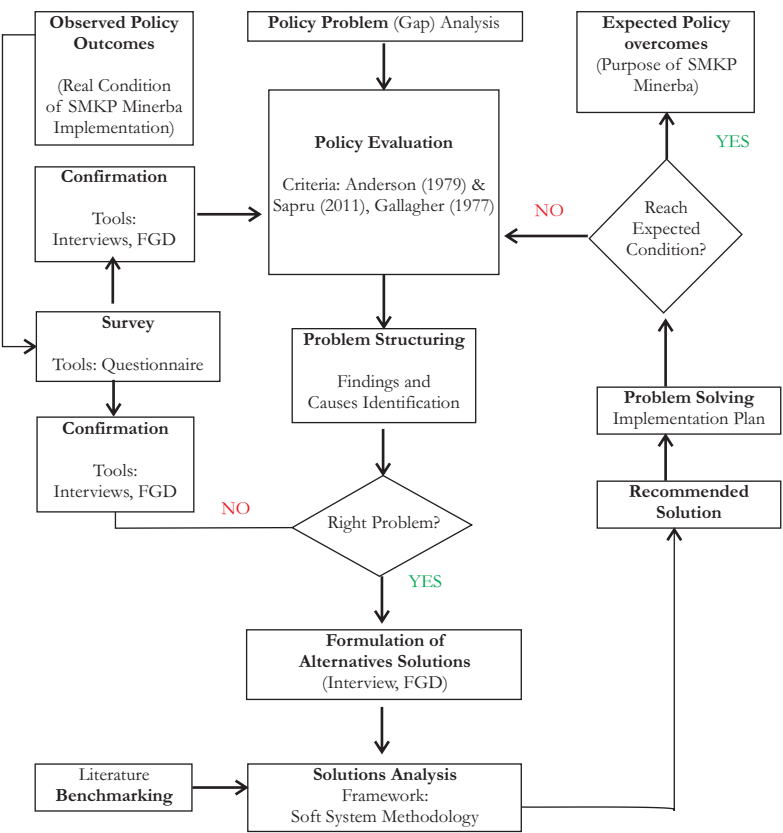

Figure 2.
Conceptual Framework

However, the data may not be robust enough to explain the complexity. Therefore qualitative data collection methods will be undertaken to understand the phenomena, including questionnaire, stakeholder interview, and focus group discussion. Questionnaires with open-ended questions were distributed to 95 mining companies. The questionnaires were presented in an open-ended questionnaire form, so the respondents can fill the answers in accordance to their will for the questions presented. Therefore, information can be collected in more descriptive. Stakeholder interview offered opportunity to capture richer, deeper, more descriptive, and more specific information of the issue from the respondent with structured list of questions. Data will be collected mainly by interviewing several Key Informants, including the representatives from stakeholders: 11 Key Informants from MEMR, 9 Key Informants from Mining Companies, and 2 Key Informants from OHS Experts. Lastly, Focus Group Discussions with stakeholders, as the final method of data collection, in order to find the real understanding of the issues, and collect suggestion for improving the situations.

The data collected were analyzed using the concept of qualitative analysis by comparing the gap of the ideal and expected conditions to the existing conditions, focused with the Public Policy Evaluation Scope proposed by Anderson (1979) and Sapru (2011). To facilitate the analysis of qualitative data, this study uses Word Cloud by NVivo11 for word coding.In addition, considering this policy related to OHSMS, then in the evaluation of the content used framework from Gallagher (1997). This study also uses triangulation concept which means data will be verified through triangulation of methods. Triangulation of methods is done to test the credibility of the data to the same source with different methods (Questionnaire, Interviews, and Focus Group Discussions). In order to improve the situation, this study does not use traditional approach with linear thinking, but used System Thinking approach with Soft System Methodology (SSM)(Checkland, 1981),

to provide realistic recommendations for future policy making. SSM is used in the first place because the understanding that 'hard' Systems Thinking was inadequate for the complexity of large organizational issues (Wang, 2015). SSM is used to structure thinking in a complex problem (Novani et.al, 2014). In this study, the MEMR as a policy maker, mining companies as policy implementers, as well as academics have their respective perceptions of the problem of SMKP Minerba policy implementation. Differences in perception are caused by the humans frame the problem. Most work involves interviews and meetings with the actors involved in gain insight of the problem situation. This will be represented by the use of 'Rich Picture' and 'CATWOE' Analysis.

Using SSM in Solution Analysis will help to provide a clear approach to the changes that need to be made to prepare ideal problem solution. In the last stage of data collection, the FGD, CLD is formed based on the barriers founded. The CLD will be used in the Stage 6 of SSM. The FGD session formulated a realistic solution to do, using a Change Management tool called an Ease Benefit Matrix. The determination of the value of the ease of implementation and benefit is also prepared on FGD. The benefit assessment refers to the CLD, to see the significance of the effect of variables on system behavior. From the results of the whole analysis, then the conclusions can be made.

Results and Discussion

Policy Evaluation
As part of public policy process, policy evaluation is an essential process in ensuring government policy to be effectively delivered to the public (Anderson, 2003). In this light, the evaluation of the Ministry of Energy and Mineral Resources Regulation (MEMR) No. 38 of 2014 on Mineral and Coal Mining Safety Management System is critical to ensure the safety of the mining companies in Indonesia. Sapru (2011) mentioned that the effectiveness, efficiency, and impact of public policy are three main factors in policy evaluation.

Expected Condition

As stated in the regulation of SMKP Minerba Article 15 Paragraph 3 the basis for the Head of Mine Inspector in determining the level of achievement of SMKP Minerba implementation is the result of audit of SMKP Minerba. From the results of the Interview, the MEMR expected the implementation in the company should be at least 75%. Then the 75% figure will be used in this study as a benchmark for the actual conditions.

Content Evaluation

As an Occupational Health and Safety Management System (OHSMS) product, evaluation of SMKP Minerba content is based on OHSMS-related theory. One way that OHSMS differ arises from the various methods of implementation. SMKP Minerba method of implementation is mandatory, as a legislative requirement.

SMKP Minerba has 7 elements consisting of Policy, Planning, Organization and Personnel, Implementation, Evaluation and Follow Up, Documentation, and Management Review. The 7 elements are then described in details into 49 sub elements. As is typical of a management system, SMKP Minerba has an OHSMS model based on the generic Plan-Do-Check-Act methodology with a view to being able to be used and developed by various companies according to the nature, scale of activities, risks and the scope of the mining companies' activities. SMKP Minerba contains general and systematic themes, mostly not much different from SMK3, but to emphasize its specificity in the Mining sub-sector it is combined with special positions in mining such as 'Kepala Teknik Tambang', 'Kepala Kapal Keruk', etc. and also practical themes such as Explosives, Blasting, and others, which are also widely adapted from Decree of the Minister of Mine and Energy Number 555.K/26/M.PE/1995 on Mining Occupational Safety and Health. Regarding the system characteristics in control strategy and management structure, based on OHSMS Classification from Gallagher (1997) SMKP Minerba has characteristics:

- Innovative management
  Top management and line management are having very firm roles and responsibilities in the health and safety effort, embodied in Element I, Element II, and Element III. There is also a high level of integration of OHS into broader management systems.
- Safe place
  SMKP Minerba is focused on the design of the stage and application of hazard identification, risk assessment and risk control principles.

So it can be categorized as a safety management system with Adaptive Hazard Manager type, which is characterized by prevention activity centered on the control of hazards at source in accordance with the identify, assessment and control framework; a problem-solving focus on employee involvement is directed to the management of key workplace hazards; a higher level of integration, or alignment, of health and safety with broader management systems. It has the required characteristics to be present for superior OHS performance. However, the thing that must be considered is the lack of elements of 'safe person' in SMKP Minerba.

SMKP Minerba is not regulating clearly and firmly how human behavior is managed and improved continuously. Competence is given a significant portion but there is no given criterion for how to form human reliability in order to minimize 'error'. Safe person criteria, such as Selection Criteria, Accommodating Diversity, Behavior Modification, Networking-Mentoring, and Review of Personnel Turnover, are not discussed in detail in SMKP Minerba. The concept of behavioral safety is not given a sufficient portion. Limited details on aspects of human behavior management is one of the shortcomings of SMKP Minerba that will affect the effectiveness. Overall, SMKP Minerba is a very good policy of highly complex formal OHSMS for mining industry and should be continued, although it will need more concise guidance for the implementation.

The result of consultation to expert also brought the similar point: *"The content of SMKP Minerba has been developed by all stakeholders in such a good way as to ensure all mining activities can be done properly and safely."*

Mining Companies' Implementation Level
From the quantitative results of the questionnaires, the issues raised in this research are confirmed true. 22% of mining companies in Indonesia had not yet implement SMKP Minerba. It is also found that only 41.05% of mining companies that already reach the level of implementation that has been expected from DTEMC.

The assessment of performance of OHSMS systems was started by identifying the level of compliance for each element, as shown on Figure 4. The identification of achievement of each element of SMKP Minerba from the questionnaires shows the percentage of respondents who have met the levels expected by the DTEMC are as follows: Policy 51.58%, Planning 52.63% Organization and Personnel 44.21%, Implementation 43.16%, Evaluation and Follow Up 40%, Documentation 40%, Management Review 37.89%. These numbers are still far from the DTEMC expected, still many provisions that cannot be met. The constraints faced to achieve expected level of implementation will be discussed in the next section.
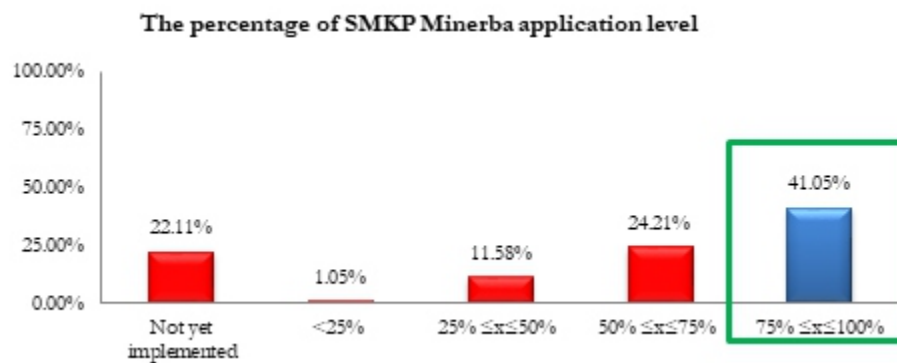

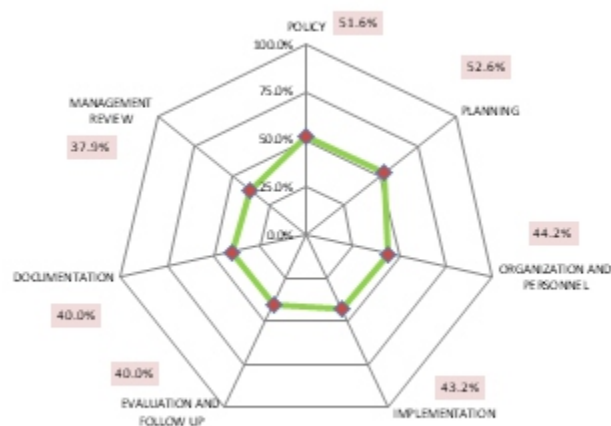*Figure 3.*
Current Implementation Level

Figure 4.
The Gap between Real Level and Expected Level (Percentage of Compliance)

However, based on the results of consultations with the Experts, the low level of implementation is not due to SMKP Minerba policy that is not relevant to the mining industry. It is believed to become higher along with the passage of time. This stats also shows that the variance and complexity of mining operations. In addition, Expert stated that currently the achievement of SMKP Minerba seems low because there is no study about the minimum timeframe required by the company to fulfill the provisions and also because there is no criteria for minimum requirement for each company.

Mining Companies' Perspective on Outcomes and Impact
SMKP Minerba stated specific goals, including: 1) to improve the effectiveness of planned, measurable, structured, and integrated Mining Safety; 2) to prevent mine accidents, occupational diseases, and hazardous occurrences; 3) to create a safe, efficient and productive mining operations; and 4) to create a safe, healthy, convenient, and efficient place to improve productivity. From goal-attainment perspective, based on the questionnaire results on objective-based evaluation, 30% of companies that have implemented SMKP Minerba have successfully achieved all the goals. But this number is not far from the company that failed to attain any goal of the implementation of this management system (23%). This is because of measuring outcomes requires a bigger commitment of time and resources in tracking performance over time. OHS outcomes from OHSMS are not easily measured. For now, with the current low level of SMKP Minerba implementation, using conventional methods is irrelevant.

The consultations with Experts expressed similar view: ''*The results of the questionnaire on this are not necessarily true, because in fact it is difficult to measure it. Because talking about OHSMS performance, decreasing accident and occupational diseases is one of the long-term impacts of SMKP Minerba. Need time.* ''

The impacts, which refer to the broader changes within company as a result of program outcomes, are also hard to measure since they may or may not happen. At present, the true positive impact already felt by most companies are still at the level of compliance with legislative requirements and on improving standards of basic safety system infrastructure.

As most of mining companies are still in the process of transition and adjustment with SMKP Minerba, so for now the improvement of mining business performance through the implementation of SMKP Minerba still cannot be measured. Currently there is limited evidence that a possible relationship exist between improved OHS Performance and highly developed SMKP Minerba, evidence is suggestive rather than conclusive.

The interviews result expressed similar views upon this question. Many believed SMKP Minerba brought expected improvement to their performance, but 'the jury is still out'. Most of Key Informants believed it will take long time for SMKP Minerba to take effect. Reasons for this uncertainty were related to lack of direct evidence, no clear record of cost-benefit, and poor consistency in implementation. The consultations to expert in this study suggested that SMKP Minerba can deliver more under the right circumstances, which depended upon the type of system employed and the conditions under which it operates. In the wrong conditions, OHSMS can be failed to deliver.

Barriers for Mining Companies
There are five major barriers for mining companies, namely internal factor of company, difficulties in managing mining service companies, nature of company, poor audit: lack of competency in conducting audit, lack of information from government programs.

1. Factor of Company
Company factors includes lack of undersanding of company personnel on SMKP Minerba, Lack of management support, commitment, and motivation, Poor

Motivation, and Unstable Workforce Characteristics. Mining companies are failed to develop SMKP Minerba mainly because their limitation of understanding on SMKP Minerba itself. Key Informants revealed that the competent person is limited. Many still need time to equip personnel to be able to understand. The lack of management support, commitment, and motivation were mentioned in the interviews. The evidence from interviews in this study identified a limited capacity for medium to smaller companies to adapt and develop SMP Minerba. In some cases they found it difficult to accessing resources because the lack of resources itself and lack of management support to spread costs in OHS, as the management still has a narrow point of view about the importance of OHS.

The diversity of Mining in Indonesia also resulted in various views of mining companies on the importance of OHS management in mining business. There are still many who adopt SMKP Minerba just for compliance of regulation and not to provide a safe workplace. Key Informants from Mine Inspectors revealed that in many cases they found that all the paper-work are organized, but unfortunately these documentation were unsupported by practice on the field. They often focus to complete the paper-work in order to pass inspection from Government. Lastly because of unstable workforce characteristics. Companies with unstable workforce, marked by high labor turnover, adopted a high number of part timers and employees from labor-hire firm, faced difficulties.

2. Difficulties in managing mining service companies.

In mining industry, service companies vary widely, from large-scale with international reputation to small-scale. Key Informants argued that mining companies that have high number of service companies faced many difficulties in managing such application in hostile contexts, such as small scale service companies, temporary employment, and labor hire companies.

Minimal workforce, lack of interest due to short duration of work, low competence, lack of familiarity with system concept, and limited resources made them difficult to meet the requirements. This proves the truth of previous study which stated that there are constraints for OHSMS implementation in the small business sector, including lack of knowledge and expertise, and a mindset not conducive to a systematic approach to health and safety management (Eakin, 1992)

3. Nature of Company

The nature of mining company also have contribution as the barrier of SMKP Minerba implementation. The mining companies do not have sufficient familiarity with system concept. Many new mining companies are currently not familiar with SMKP Minerba. As a new product of OHSMS, they require a new culture of working/ In some cases, the workers' adaptation process of new work culture is slow. For middle and smaller size companies, they have a limited resources to implement SMKP Minerba. Middle to lower companies will have limitation of resources to fulfill SMKP Minerba in accordance with the time frame given by MEMR. The limited resources are also faced by exploration companies. Mining exploration activity has very high financial risk. Therefore they will control their operating cost and it will be limit them to develop SMKP Minerba.

4. Poor Audit: Lack of competency in conducting Audit.

The interviews revealed some evidences that SMKP Minerba Internal Audits were conducted without sound auditor skills, standards, and criteria. MEMR's evaluation of the audit results shows that there are still many errors in the reporting form. In addition to limited competence, Key Informants expressed that in some companies there are challenges for auditor to control himself and remain objectives in auditing. There is conflict of interest so they tend to give easy scores and often lead to an unhealthy approach. Besides, it is conducted in a hurry, leaded to ineffective audit.

5. Lack of information from Government programs.

The comparison between the results obtained based on each method of data collection done can be seen in Table 1.

Table 1.
Triangulation of Barriers

Questionnaire	Interview	Focus Group Discussion

1. Lack of understanding and competence	1. Lack of understanding and competence	1. Internal Factor of Company
		    Lack of understanding
		    Lack of management support, commitment, and motivation
		    Unstable workforce characteristic

2. Lack of resources to meet the standard and deadline date	2. Lack of familiarity with new system	2. Contractors Relation Difficulties in managing mining service companies.

3. Difficulties in managing and synchronizing with Service Companies	3. Lack of resources and top level management support for medium to small mining companies	3. Nature of Company
		    Lack of resources for middle to lower companies.
		    Lack of familiarity with system concept
		    Lack of resources for exploration companies

4. Difficulties in conducting Audit	4. Wrong motivation of implementation	4. Lack of competency in conducting Audit
5. Limitations of financial support from management.	5. Difficulties in Managing Service Companies	5. Lack of communication and lack of information from Government programs.
6. Not stable workforce	6. Poor Audit Implementation	
7. Lack of familiarity with system concept		
8. Lack of information from Government programs.		
9. Lack of resources for exploration companies		
10. Constraints in other operational permits		

System Thinking

Causal Loop Diagram
This study uses the Causal Loop Diagram (CLD)'s unique ability to identify and visually display intricate processes. It provides a language for articulating our understanding of the interconnected nature of the world of this study. The CLD in this study is formed on the Focus Group Discussion (FGD) and is used to define a list of alternative solutions that will be assessed at a later stage of this study. The barriers founded on the evaluation are translated into variables in the system of SMKP Minerba Implementation in order to develop CLD as seen on Figure 5. The CLD shows that the role of the competence of mining companies as policy implementer has a significant influence to determine the behavior of the system, as it has the most reinforcing loop, along with Mining companies' program to support SMKP Minerba. Mining companies' competencies are the initial capital for the establishment of appropriate systems, proper audit implementation, and the growth of familiarity with new work culture based on SMKP Minerba. Therefore, to improve the competence of the policy implementer, it is necessary to optimize the MEMR and company programs in supporting the implementation of SMKP Minerba. MEMR can start by improving the competence of the Mine Inspector, since the competence of the supervisor will indirectly affect the competence of the mining companies.
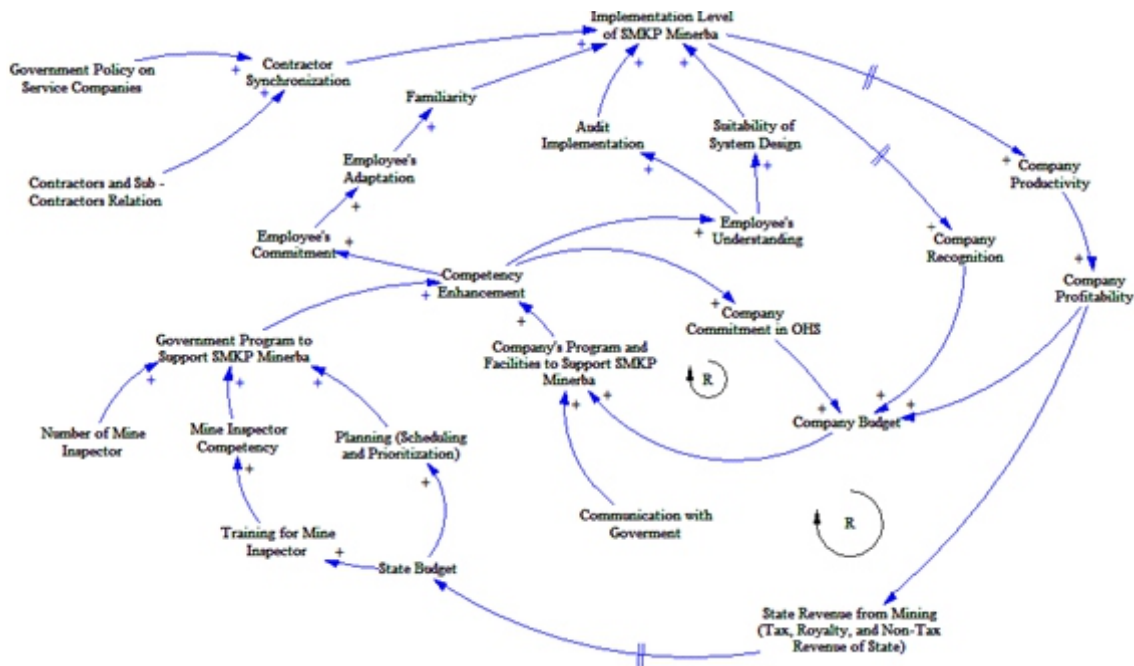
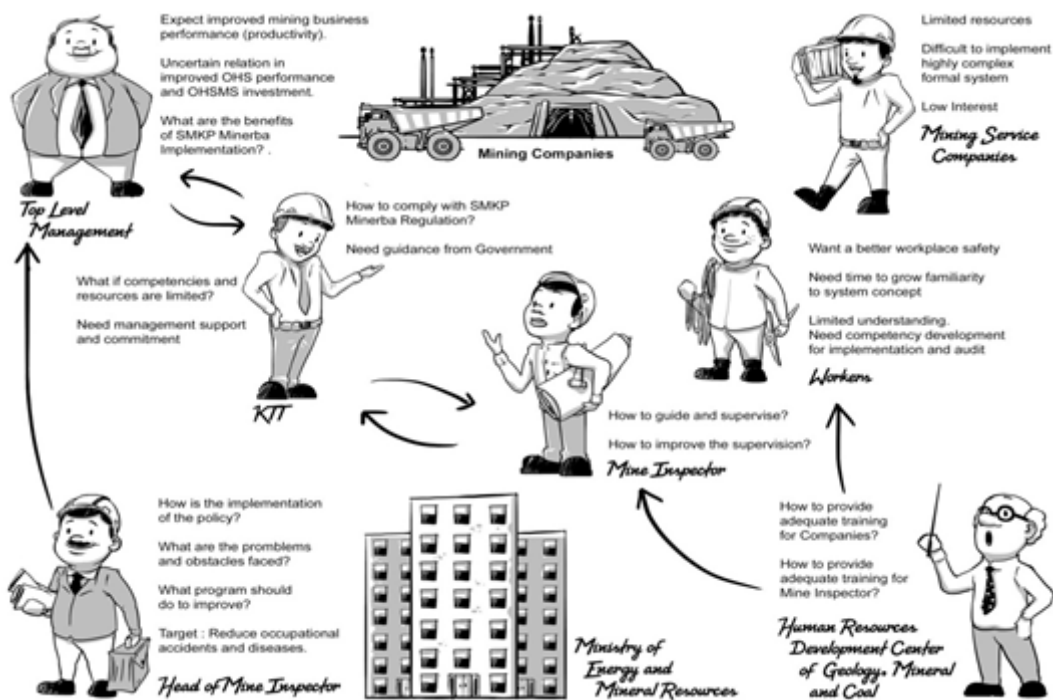*Figure 5.*
Causal Loop Diagram of SMKP Minerba Implementation

Figure 6.
Rich Picture

Soft System Methodology

Step 1 Enter situation considered problematic
After 3 years of publication, the level of SMKP Minerba Policy implementation in mining companies had not yet reached the level expected by MEMR. Mining companies face obstacles that lead to low levels of implementation. MEMR is also still not optimal in conducting guidance and supervision.

Step 2 Express the problem situation:
Based on the results of data collection series, it was obtained some information of problem situations from the perspective of companies and government as stated in the following Rich Picture.

Step 3 Formulate Root Definitions of relevant systems of purposeful behaviour
The system to be changed is the implementation level of SMKP Minerba in mineral and coal mining companies.

Figure 7.
Input-Output Diagram

The next step is Root Definition, which consists of Root Definition consists of naming the system which supports each transformation. To help ensure that a draft Root Definition is acceptable by CATWOE Analysis by Checkland and Smith (1976):

1. *The Customer:* The parties who receive the output from the transformation in SMKP Minerba Policy Implementation are mining companies.
2. *The Actors:* The parties who directly involved in SMKP Minerba Policy Implementation are Mining Companies; especially KTT and Safety Division; and MEMR, represented by DTEMC and Mine Inspector.
3. *The Transformation:* The purposeful activity expressed as a transformation of input to output is refers to the improvement program for SMKP Minerba Policy, which is new mandatory OHSMS for all mining companies and service companies in Indonesia. Previously there is no mandatory OHSMS for mining industry.
4. *The World View / Weltanschauung:* Te belief that makes sense of the root definition is the purpose of SMKP Minerba itself, including: to improve the effectiveness of planned, measurable, structured, and integrated Mining Safety;

5. *The Owner:* The wider system decision maker who concerned with the performance of the system is the responsible institutions for the achievement of policy, and it is MEMR.
6. *Environmental Constraints:* Based on the data collection results, there are no significant barriers outside the system boundary.

Step 4: Build Conceptual Model of Human Activity Systems
This stage is including analysis of the activities which need to take place by The Actors in order to clearly define what the actors need to do in order to achieve the transformation. The activies of Mining Companies: 1) develop SMKP Minerba by customizing to organizational needs; 2) Provide strong management commitment in OHS; 3) Conduct proper Internal Audit for continuous improvement; and 4) Assist service companies to develop compatible SMKP Minerba, especially application in hostile contexts. The activities of MEMR: 1) Set the relevant policy executor; 2) Set the right implementation deadline; 3) Prepare the policy implementers (mining companies) awareness and competence; 4) Prepare the supervisor (Mine Inspector) readiness. The next step is relating the activities together graphically, with monitor and feedback activities, as shown on Figure below.
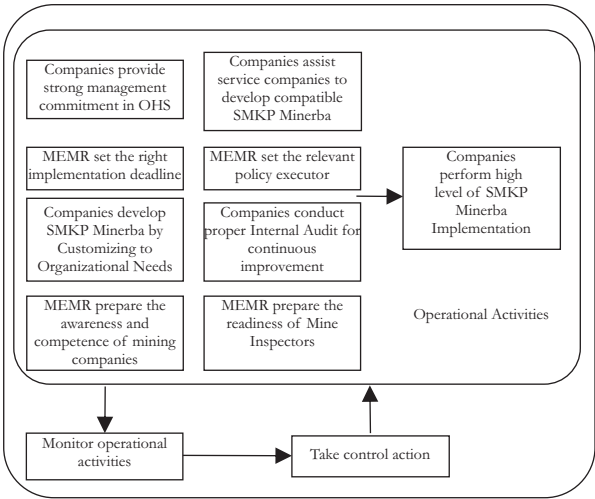
Figure 8.
Conceptual Model of Human Activities

Step 5: Compare Models with the Real world
The comparison in this step is made to see is the differences between what happened in reality and the logical model, so it can help to initiate discussion from which changes to improve the situation can be identified. From the view of Mining Companies, the comparison is as follows.

Table 2.
Comparison between Models and Real World: Mining Companies

Conceptual Model Activities	Real World	Barriers (from Data Collection)	What could we do Alternatives of Solution (from Data Collection)
Develop SMKP Minerba by customizing to organizational needs	1. Successfully develop SMKP Minerba , or 2. Develop SMKP Minerba without modification , or 3. Unable to develop SMKP Minerba	1. Lack of understanding of company personnel towards SMKP Minerba 2. Lack of familiarity with system concept 3. Not stable workforce 4. Lack of resources for the middle to lower companies.	1. Companies can provide competency development program for workforces (1) 2. MEMR can provide more supervision and guidance for companies (2)
Provide strong management commitment in OHS	1. Strong management support in OHS (adequate resources and strong involvement) 2. 'Minimalist Approach' for OHS, introduced just for compliance (non OHS - reasons) 3. Weak management support in OHS	1. Lack of management support and commitment 2. Lack of resources for the middle to lower companies. 3. Lack of resources for exploration companies 4. Wrong motivation of implementation	1. Top Level Ma nagement can be encouraged of the importance of SMKP Minerba to its business performance (3) 2. MEMR can do more law enforcement for Companies' Top Level Management (4) 3. MEMR can make reward and punishment (5)
Conduct proper Internal Audit for continuous improvement	1. Appropriate Implementation of Audit 2. Inappropriate use of Audit	1. Lack of competency in conducting Audit 2. Lack of standard and criteria in scoring 3. Challenges for internal auditor to control himself and remain neutral and objective	1. Companies can provide Audit competency development program for workforces (6) 2. MEMR can provide more Audit guidance (7) 3. MEMR can appoint External Auditor Institution (8)
Assist service companies to develop compatible SMKP Minerba, especially in hostile contexts	Mining s ervice companies faced difficulties to develop SMKP Minerba	1. Lack of familiarity with systems 2. Lack of understanding 3. Limited resources 4. Low interest in safety (short duration of work, small scale) 5. Limited in basic skillset (read & write)	1. Companies can set minimum criteria for SMKP Minerba implementation for service companies (9) 2. MEMR can instruct companies' KTT to set the mechanism for service companies. (10)

For Government perspectives, the comparison is as follows.

Table 3.
Comparison between Models and Real World: Government

Conceptual Model Activities	Real World	Barriers (from Data Collection)	What could we do Alternatives of Solution (from Data Collection)
Set the relevant policy executor	All mining companies and mining service companies must implement SMKP Minerba . Some companies have successfully implemented SMKP Minerba, while other companies have difficulties due to their limitations.	Diversity of Mining Companies in Indonesia, in terms of capability: (resources, competence, familiarity of system, management commitment)	MEMR can set the criteria of minimum implementation for mining companies and mining service companies. (11)
Set the right implementation deadline	SMKP Minerba should be implemented one year after the issuance. Currently, after three years of publication, the application level is still very low. Companies are finding it difficult to comply with the government -mandated timelines.	Unpreparedness from MEMR and the mining companies	MEMR can provide annual target level of SMKP Minerba implementation in the mining companies, focusing on continuous improvement (12)
Prepare the policy implementers (mining companies) awareness and competence	1. MEMR has do the dissemination of SMKP Minerba 2. MEMR has held Training 3. MEMR has held a Coaching Clinic to evaluate the implementation of Internal Audit of SMKP Minerba 4. MEMR has not conducted supervision to the companies' job site for SMKP Minerba	1. Limited in formal promotion 2. Limited guidance and supervision program 3. Limited training capacity and frequency 4. Limited budget for supporting programs	1. MEMR can provide more competency development program for companies (13) 2. MEMR can provide more supervision and guidance for companies (2) 3. MEMR can increase the public awareness of SMKP Minerba (14) 4. MEMR can propose extra budget for more supporting programs (15)
Prepare the supervisor (Mine Inspector) readiness	1. Mine Inspector is required to learn independently, no training or special briefing on SMKP Minerba supervision 2. There is no guidance or standard operating procedure for SMKP Minerba supervision	1. No training for Mine Inspector 2. Limited Budget 3. Program Prioritization (focus on other programs) 4. Limited number of Mine Inspector	1. MEMR can provide competency development program for Mine Inspectors (16) 2. MEMR can provide guideline and standard operating procedure for supervision (17) 3. MEMR can optimize the role o f Mine Inspector from Local/Regional Government (18) 4. MEMR can propose for additional Mine Inspector in Mining Safety Sub Directorate (19)

Step 6: Define Changes that are both Desirable and Feasible

The table shown in Table 2 and Table 3 contains a number of things we could do that would take the real-world actuality closer to the Conceptual Model. In the ideal world all the recommendations would be implemented. However, both companies and government have finite resources, in terms of budget and workforce. The approach used to choose the realistic solutions in this study is a Change Management tool called an Ease Benefit Matrix, as shown in Figure 10. The numbers relate back to the "Alternatives of Solution" column in Table 2 and Table 3.

The determination of the value of ease of implementation and benefit is also prepared on FGD. The benefit assessment also refers to the model of CLD, to see the significance of the effect of variables on system behavior. Based on the matrix, the Prioritization Grid is made, thus eliminating the choice of solutions that have small impact with high difficulty level of implementation.
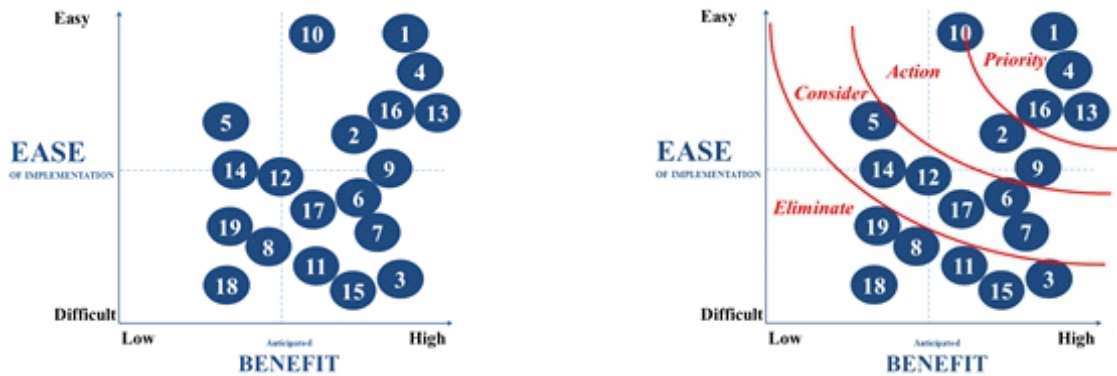
Figure 10.
Ease Benefit Matrix and Prioritization Grid

Step 7 Take Actions to Improve the Problem Situation:
The changes that are considered 'desirable' effort are:

1. Number 1: Companies can provide competency development program for workforces;
2. Number 4: MEMR can do more law enforcement for Companies' Top Level Management;
3. Number 13: MEMR can provide more competency development program for companies;
4. Number 16: MEMR can provide competency development program for Mine Inspectors;
5. Number 10: MEMR can instruct companies' KTT to set the mechanism for service companies;
6. Number 9: Companies can set minimum criteria for SMKP Minerba implementation for service companies;
7. Number 2: MEMR can provide more supervision and guidance for companies;
8. Number 7: MEMR can provide more Audit guidance;
9. Number 6: Companies can provide Audit competency development program for workforces;
10. Number 17: MEMR can provide guideline and standard operating procedure for supervision;
11. Number 12: MEMR can provide annual target level of SMKP Minerba implementation in the mining companies, focusing on continuous improvement;
12. Number 14: MEMR can increase the public awareness of SMKP Minerba; and
13. Number 5: MEMR can make reward and punishment.

The implementation of those actions is described in more details in the Solution part.

Solution
Based on System Thinking approach, this study suggested some solutions for improving the implementation of SMKP Minerba.

1. Dissemination and Promotion to Top Level Management
As an Adaptive Hazard Manager type of OHSMS, Top Level Management commitment and support is a precondition for successful implementation of SMKP Minerba. The commitment can be demonstrated by provision of necessary resources, leading by example, and prioritization for OHSMS in corporate policy and actions. This study found the evidences that there is still a paradigm of some companies' leader who viewed OHS only as a tender requirement, or worse they consider OHS as cost. Although SMKP Minerba is mandatory policy, there are still companies that use a 'minimalist approach' of fulfillment. In the ups and downs of the mining business attractiveness, most companies were doing efficiency. MEMR as supervisors have a duty to ensure that efficiency does not mean ignoring the management of the OHS aspect. Conversely, the OHS aspect must be able to bring the company more efficient because it can prevent accidental losses.

Top Level Management of company need to be encouraged not only oriented to the production alone, but also the control of losses. If SMKP Minerba is not implemented properly then it will affect the competitiveness of the company.

In addition to the economic reason, ie to prevent direct and indirect cost of the accidents and illnesses, and the reasons for legislative requirements, more importantly in fact all improvement efforts in the SMKP Minerba is to improve protection of Human Rights. Workers should not be treated as passive asset to be bought, sold and replace. SMKP Minerba can be an approach to manage workers that regards them as capital, and emphasizes that business competitive advantage is achieved by strategic investment in those capital. MEMR through DTEMC can send Head of Mine Inspector Letter to the top level management of companies to give instruction for supporting SMKP Minerba. To ensure the support and commitment, DTEMC can request Integrity Pact from mining companies. The next level of 'enforcement' is setting minimum SMKP Minerba Implementation Level as requirement to get safety-related permit, such as RKAB.

2. SMKP Minerba Competency Development Program for Mine Inspector

DTEMC should submit an Official Training for Mine Inspector program proposal to Human Resources Center of Geology, Mineral, and Coal (HRDCGMC). While waiting for that, and considering the limited budget available, DTEMC can actively develop internal competencies enrichment activities, including: 1) Internal Training / Workshop facilitated by Mine Inspector who already has more understanding on SMKP Minerba; 2) Experience Sharing from the Mine Inspector after conducting special supervision of SMKP Minerba 3) Small Group Discussion, which can be done monthly, to discuss about SMKP Minerba, and mutual enrich each other's knowledge; and 4) Mentoring Scheme, conducted by the Mining Safety Officials on a voluntary basis to provide advice and support.

SMKP Minerba Competency Development Program for Mining Companies

As seen in the visualization of the system through the Causal Loop Diagram and Rich Picture, it appears that this competency will affect the suitability of developed system with the needs of the organization and to the level of adaptation with the new system as well as the motivation. Competency improvement is absolutely required. Mining Companies needs competent workforces for the SMKP Minerba work they undertake. Trainings will help develop such competence.

Given SMKP Minerba is a new thing in Indonesian mining, companies found it difficult to conduct self-learning, so that the competency development will depend more on external training providers. Currently, training providers are from MEMR through HRDCGMC and private training providers. As revealed in thiss study, not all mining companies have the financial ability to send their employees to participate in training from private providers. Companies also tend to have more confidence by sending their employees to participate in training from Government. While training from MEMR were very limited in terms of capacity and frequency. MEMR has a big task to overcome this by increasing the capacity and frequency of training. And no less important, MEMR must also ensure that the training information is properly delivered.

In addition, MEMR should continue the current program of 'Coaching Clinic' by inviting companies that have submitted audit reports and give them consultation session for improvement, in order to share the same perceptions between policymakers and implementers. Given MEMR's program will be limited by the availability of the State-Budget, MEMR must also be creative to overcome this, and the other programs that can be done are including encourage mining companies to hold in-house training, and invite MEMR to become the facilitator, Create SMKP Minerba Implementation Guideline and develop online learning media.

Encouraging mining companies to hold in-house training, and invite MEMR to become the facilitator may be the best solution for all. Companies will have advantage to train more employees and MEMR also can do its duties in guiding without concern of budget. It can even be implemented more efficiently by creating a tailor-made training, which is designed to meet the specific needs and requirements of the requesting firms. By creating SMKP Minerba Implementation Guideline, it is expected to assist companies to develop systems in accordance with SMKP Minerba as well as to equate perceptions for fulfillment and assessment of each element. Lastly, program to develop an online learning media. Learning method should be adapted with the current digital revolution. Now DTEMC already has SIMKP Minerba as framework for online reporting, and this media can be utilized also for information sharing.

4. Setting Minimum Criteria of SMKP Minerba Implementation for Service Companies

OHSMS are said to assume a stable workforce and a stable workplace (Quinlan, 1999), and the growing numbers of service companies which made broader changes in organisational structures and employment patterns may create barriers that should be solved. Service companies in mining are an important element in the company as a partner that helps the operations of the company. Because it is an integral part of mining operations, the contractor is also prone to accidents. Data from MEMR shows that in the period 2011-2016 most of mine accidents happened to workers of service companies.
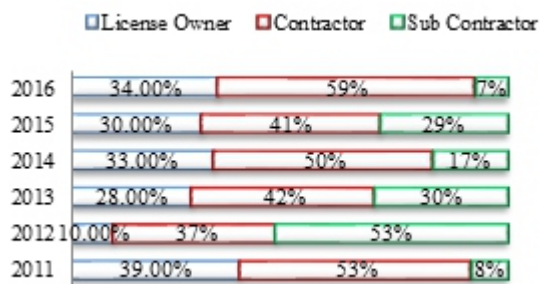

Figure 11.
Mine Accidents based on Victims' Employment Status (*Source: Sub Directorate of Mining Safety, DTEMC*)

Therefore, the service companies' activities must be properly managed to ensure safety in every contractor's work activities. The arrangement of minimum criteria should be entrusted to the company. MEMR should give the authorities to KTT in setting the minimum criteria of implementation of the service companies on their areas, based on risk (can be seen by the numbers of Job Safety Analysis).

Currently, most mining companies in Indonesia have developed Contractor Safety Management System (CSMS), which is a management system to manage contractors working in the company environment, which is done from the planning stage until the work implementation. CSMS can be the bridge to connect SMKP Minerba from the holding company with the contractor OHSMS. Therefore, to help improve the implementation of SMKP Minerba in the service sector, it can be started by providing a basic framework for the development of contractor OHSMS that refers to SMKP Minerba, as well as requirements that must be met. The license holder company will need to modify the existing CSMS to refer to SMKP Minerba to ensure that every service company working within the company has met the SMKP Minerba standards and criteria set by the company. It means the procurement division of the company needs to make an agreement that every contractor must comply with the rules related to SMKP Minerba as stated in the Work Plan and Terms.

The requirement for contractors to have an 'CSMS fit to SMKP Minerba' is believed to slowly transforming the attitudes of contractors towards OHS. Mayhew and Ferris's research supports these views. They found it 'improved knowledge of OHS legislation, led to more frequent inclusion of OHS clauses in contracts, and resulted in more effective hazard control measures' (Mayhew & Ferris, 1998:357-62).

5. *Optimizing the Role of SMKP Minerba Audit*

Audit played critical role for company's continuous improvement of SMKP Minerba Implementation. Companies also needs audit to assure that they already adopt and develop good OHSMS, which means greater self-insurance for them. Currently there are real concerns that the internal audit process is inappropriate because limited auditor competence, no real standards for scoring, and conflict of interest. MEMR should provide Official Training for SMKP Minerba Auditor to assure the standardization of SMKP Minerba Internal Audit. Audit will play a major role in shaping the design, and by doing audit they also will learn to develop SMKP Minerba based on Audit Tools.

In addition, the MEMR should also appoint the External Audit Institution. The External Auditor is required when the Head of Mine Inspector requests the company to conduct an external audit in the event of an accident, disaster, or dangerous event. In addition, the company may also conduct an External Audit for the purposes of a mining safety performance assessment. Generally, companies generally seeking accredited OHSMS for commercial objectives, such as to meet tendering requirements, and for public relations objective. Therefore this needs to be emphasized more by the MEMR, that the External Audit is voluntary. The External Audit Institution must have the expertise as an independent, impartial auditor, responsibility, openness, confidentiality and prompt response to complaints, as evidenced by accreditation. In addition, most importantly, to be more efficient, the External Audit Institution SMKP Minerba also must be willing to produce two outputs of Audit, the certificate of SMKP Minerba and SMK3. This can be a common solution in the simplification of cross-sectoral regulatory compliance.

6. *SMKP Minerba Supervision*

Supervision may include supervision of administrative check to ensure compliance with the terms, conditions or regulations; as well as operational inspection to measure the efficiency and effectiveness of SMKP Minerba implementation in operating activities in relation to the achievement of objectives. MEMR must establish a supervisory implementation mechanism set in the Guidelines for SMKP Minerba Supervision and Standard Operating Procedure so that each Mine Inspector shall have the same standards. In addition, the results of SMKP Minerba supervision should be written in a report made objectively and completely, so it can be useful for the MEMR to make the next policy. This report can also be the basis for improvement goals of the company.

For the priority of monitoring objectives, MEMR should prioritize companies that are still low levels of achievement based on the Internal Audit Report. In addition to creating a 'Coaching Clinic' program, there must be an 'Intensive Care Unit (ICU)' program for 'seriously ill' companies. The efforts of coaching these companies should be done more by making a direct supervision to the field.

7. *Innovation for Annual Safety Award*

MEMR can improve the prestige of SMKP Minerba by slightly modifying the implementation of the annual Safety Assessment program, which is currently known as the Safety Award, by integrating the implementation of SMKP Minerba as criteria of the assessment. From the government side, the Safety Award Program needs to be maintained to give appreciation to the business players while improving the motivation of SMKP Minerba implementation nationally. In addition, the Safety Award can also be a measure of the extent to which the position of efforts that have been done by the MEMR and the company for the fulfillment of legislation. As an 'event', the Safety Award is essential to strengthen the brand of SMKP Minerba in the public sphere, giving fresh blood to the industrial community that their role is honored. From the perspective of mining companies, Reward Motivation is still one of the strong driving, because it can improve the image and reputation of the company.

In the long term, it is expected that the Safety Award can also make the Awardee more aware that what has been done in the implementation of SMKP Minerba is good not only for reputation but also for humanity, thus bringing the motivation of more level of application in the direction of safety culture, that is Need Motivation which views OHS as a necessity. In addition, MEMR can appoint the winners of Safety Award as a role model of SMKP Minerba implementation for the next year.

8. Strict Sanctions for Violations

After three years of this regulation, it is time for the MEMR to be firm for violations as a form of law enforcement. Punishment in this case does not mean effort 'off hands' from the government to harm the company. However, this punishment is done like the parents punish their children, for norm reinforcement. Children fear of punishment, but they can grow their sense of the norms society has set by seeing the others being punished. These practices can be an integral part of socialization, and change of behavior as a part of a system of pedagogy.

9. Increasing Awareness and Recognition of SMKP Minerba

SMKP Minerba should be viewed not only as a policy, but also a product. If SMKP Minerba was analyzed as a 'product', then the unique selling proposition (USP) of SMKP Minerba is 'the only OHSMS in Indonesia that adapts to the characteristics of the mining areas that is mandatory as a legislation product'. The real differentiator are the mandatory and industry-specific (mining). In the market rules, the product must be introduced first to be known of its USP and benefits by the market. Awareness on SMKP Minerba should be not only in bigger companies, but also in smaller ones, including service companies. MEMR should slowly grow the attractiveness of SMKP Minerba in the eyes of all stakeholders, including local Government.

In this study, the authors set the study population limited to mining companies whose permits are granted by the MEMR Mining Companies whose licenses are granted by local Governments and Mining Services Companies are excluded. The measurement of the compliance rate of the Mining Companies is based on their reporting compliance to the MEMR. No measurements on the implementation of SMKP Minerba in the field.

This study used MEMR dataset for the period from August to December 2017. There are some potential limitations of the dataset, including the accuracy of the data in the documents reported by the Mining Companies, as there was no opportunity for MEMR to check the data directly. Further research is possible to evaluate the implementation of SMKP Minerba to other populations, such as Mining Companies whose license granted by Local and Regional Government and Mining Service Companies.

Conclusion

The results of data collection showed that only 41% of mining companies which achieved the expected level of implementation. Most of mining companies are still in process of transition and adjustment with SMKP Minerba. As a result, the outcomes and impact of this policy are still hard to measure, especially for now there are many barriers for effective implementation. However, this policy should be continued by MEMR. SMKP Minerba has been formulated by stakeholders in such a good way as to ensure all mining activities can be done properly and safely. As an 'Adaptive Hazard Manager' type, it has the required characteristics to be present for superior OHS performance. Therefore, what can be improved from the current state is support the effectiveness of this system. It will deliver more healthy and safe workplaces under the right conditions.

The barriers to the SMKP Minerba Implementation for Mining Companies are: 1) Internal Factor of Company: lack of understanding of company personnel on SMKP Minerba, lack of management support and commitment (motivation), and not stable workforce; 2) Contractors Relation: Difficulties in managing mining service companies; 3) Nature of Company: lack of resources for middle to lower companies, lack of familiarity with system concept, lack of resources for exploration companies; 4) Audit: Lack of competency in conducting SMKP Minerba Internal Audit; 5) Lack of communication and lack of information from Government programs.

The Government Interventions should be taken to improve the situation are: 1) SMKP Minerba Dissemination to Mining Companies' Top Level Management; 2) SMKP Minerba Competency Development for Mine Inspector; 3) SMKP Minerba Competency Development for Companies; 4) Setting Minimum Criteria of SMKP Minerba Implementation for Service Companies; 5) Optimizing the Role of SMKP Minerba Audit; 6) SMKP Minerba Supervision; 7) Innovation for Safety Award; 8) Strict Sanctions for Violations; 9) Increasing Awareness and Recognition of SMKP Minerba.

Considering the limitation, the realistic options for SMKP Minerba campaign are: 1) Update the Database of Stakeholders; 2) Hold more 'SMKP Minerba' event in Jakarta that invites mining companies' top level management; 3) Launch a PR campaign related to SMKP Minerba; 4) Make cooperation with credible print media, including getting free advertising; 5) MEMR should provide digital information media that can be accessed from mobile phone or web; and 6) Launching Influencer Marketing as word of mouth is believed to be the most powerful marketing tools. MEMR can optimize the role of Mine Inspector as direct supervisor to promote SMKP Minerba in the field.

References

Anderson, J.E. (1979). *Public policy making, second edition.* New York: Holt, Rinehart and Winston.

Anderson, J. E. (2003). *Public policy making: an introduction.* Boston: Houghton.

Checkland, P., & Scholes, J. (1999). *Soft systems methodology in action.* Wiley.

Cohen, A., & Smith, B. (1975). Safety *Program Practices in High vs Low Accident Rate Companies - An Interim Report, National Institute of Occupational Safety and Health, Publication* No. 75-185, Cincinatti.

Cohen, H., & Cleveland, R. (1983). *Safety program practices in record-holding plants,* Professional Safety, 26-32.

Creswell, J.W., & Plano Clark VL. (2007). *Designing and conducting mixed methods research.* Thousand Oaks, CA: Sage.

Du Pont de Nemours and Co. (1988). S*afety training observation program,* Delaware.

Eakin, J. (1992) Leaving it up to the Workers: Sociological Perspectives on the Management of Health and Safety in Small Workplaces, *International Journal of Health Services,* 22(4), 689-704.

Gallagher, C. (1997). *Health and safety management systems: an analysis of system types and effectiveness, national key centre in industrial relations.* Monash University, Melbourne.

Gallagher, C. (2000). *Occupational health & safety management systems: system types and effectiveness,* Deakin University, Melbourne.

Hopkins, A. (2000). *Lessons from Longford: The Esso Gas Plant Explosion,* CCH Australia Limited, Sydney.

Hovden, J., & Tinmannsvik, R. (1990) Internal control: a strategy for occupational safety and health: experiences from Norway. *Journal of Occupational Accidents,* 12, 21- 30.

Mayhew, C., & Ferris, R. (1998). The impact of the legislative requirement for the completion of workplace health and safety plans on small-scale Queensland builders. *Journal of Occupational Health & Safety - Australia and New Zealand,* 14, 357-362.

Novani, S, Putro, U.S., & Hermawan, P. (2014). An application of soft system methodology in batik industrial cluster Solo by using service system science perspective. *Procedia - Social and Behavioral Sciences,* 115 (1), 324-331.

Pearse, W. (2000). *Club zero: implementing ohs management systems in small to medium fabricated metal product companies,* Paper presented at the First National Conference on Occupational Health and Safety Management Systems, UWS, Sydney.

Sapru, R.K. (2011). *Public policy: art and craft of policy analysis, second edition.* New Delhi: PHI Learning Private Limited.

Simonds, R.H., & Shafai-Sahrai Y. (1977). Factors apparently affecting injury frequency in eleven matched pairs of companies. *Journal of Safety Research* 9(3):120–127.

Smith, M., Cohen, H., Cohen, A., & Cleveland, R. (1978). Characteristics of successful safety programs. *Journal of Safety Research,* 10 (1), 5-15.

Quinlan, M. (1999) Promoting occupational health and safety management systems: a pathway to success - maybe. *Journal of Occupational Health and Safety - Australia and New Zealand,* 15 (6), 535-541.

Walters, D. (1998) Health and safety strategies in a changing Europe, *International Journal of Health Services,* 28 (2), 305-331.

Wang, Wei, Webin Liu, & John Mingers. (2015). A Systemic method for organizational stakeholder identification and analysis using soft systems methodology (SSM). *European Journal of Operational Research,* 264, 562-574.