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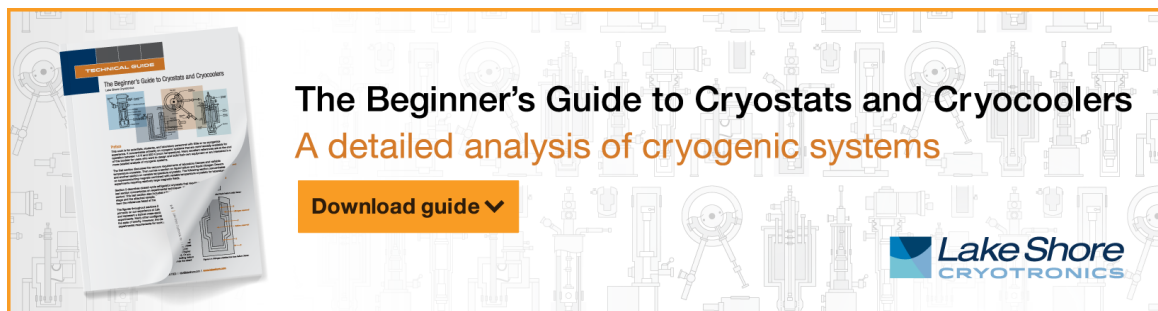


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Sustainability Mining Technology in Indonesia Supported From Regulatory Side

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Abstract. The global view requires sustainable development. The principle that must be applied in the national development activities of each nation. This has implications for management that must pay attention to social, environment and economic sustainability. The use of sustainable technology is one means that must be chosen. The main goal can be realized. The problem that became the study in this paper is how do you use sustainable technology? For key words used are general forms, data forms as secondary data, regulatory approach, prescriptive nature of research and deductive data analysis techniques. The results of the study show that in the perspective of positive law, the enthusiasm to use technology is available in the PPLH Law, but unfortunately the Mining Law does not explicitly require "sustainable mining technology". Therefore, in the future there needs to be a policy reform on the use of technology to support sustainability in the Mining Law.

INTRODUCTION

Indonesia is a country that has abundant natural resources in the form of mineral and coal mining. Mining management in principle has solid technological characteristics. Technology is an integral element at all stages of mining activities to achieve the greatest prosperity of the people. Technology seems to be a determining factor for the future of mining in Indonesia. In one of the research documents entitled "100 Innovations in the Mining Industry" has provided information about various innovations found in the framework of mining development and management including for the needs of exploration, ore extraction, transportation and communication, ore processing, health and safety and others [1] In addition to technology, another characteristic is the mining business activity which is one of the activities that has a high risk of environmental damage. These two characteristics, technology and environmental damage are often related entities. Environmental damage comes from the use of technology that is not environmentally friendly and comes from waste produced by mining products. This environmental damage will have an impact on the social, environment, and economic life of a country.

The case of overflowing Lapindo mudflow in Sidoarjo is evidence that there is a problem in the government's social, environment, and economic life due to mining business activities and the use of technology. In order to avoid the impact of environmental, social and economic damage, an environmentally friendly technology is needed or in this paper it is called sustainable mining technology. In connection with this matter the United Nations in the United Nations Conference on Sustainable Development facilitates nine mining companies formed what was called the Global Mining Initiative (GMI) in 1999. The GMI in turn led to two notable outcomes: the Mining, Minerals and Sustainable Development (MMSD) project, and the transformation of ICME into the ICMM [2], [3], [4]. This is what in the legal context must be a concern and regulated in a regulation. But at present, the basic rules that are the reference for mining business activities are Law Number 4 of 2009 concerning Mineral and Coal Mining (Mining Law), but this regulation

has not regulated the company's obligation to implement sustainable mining technology. The focus of this paper is to create a legal framework model for the application of sustainable mining technology in Indonesia.

METHOD

The research method in this study is doctrinal research, using secondary data related to sustainable mining technology obtained through literature studies and approach to legislation, then the data collected is then selected to be carried out with qualitative data processing, then the data is concluded with deductive reasoning and poured analytically descriptive.

RESULT AND DISCUSS

Sustainable mining technology is an activity that puts social, economic, and environmental aspects in harmony with the aim that mining natural resources can not only be enjoyed by current generations, but also future generations. To make it happen, mining technology must pay attention to social sustainability, economic sustainability and environmental sustainability. Sustainability in the context of sustainable development interacts and cannot be separated from each other. Athena Kurry provides an overview of interactions and harmonization between social, economic and environmental aspects in the following mining activities [5]:



Figure 1. Linkage Variety of "Sustainable" Goals

Arrangements concerning sustainable development are generally regulated in Law Number 32 of 2009 concerning Environmental Protection and Management (UUPPLH). In Article 1 paragraph (3) of the Company Law, sustainable development is defined as a conscious and planned effort that integrates environmental, social and economic aspects into a development strategy to ensure the integrity of the environment and the safety, capability, welfare and quality of life of the present generation and future generation.

For this reason, the application of sustainable mining technology is an obligation for mining companies in Indonesia. Obligations between mining companies are even written in an agreement such as the Mining Work Contract. What is contained in the contract, by Rene KEMP is called as a form of "promising to reduce the environmental burden of their products and activities" from mining companies to the Government of Indonesia [6]. But in the level of implementation, companies often only think about efficiency without considering aspects of sustainable development through the application of sustainable technology. The application of sustainable technology is a necessity and is a way to overcome the problem of environmental damage that occurs due to mining business, and on this matter Rufai Haruna Kilu based on what was conveyed by Grubb, Huber and Hoff, emphasized that It is evident that fighting environmental problems necessarily involve the rigorous application and diffusion of technologies [7].

The use of a particular technology in the management of mining is certainly based on certain considerations. Theoretically concerning the choice of theory use, there is a theory of "Technology Acceptance Model (TAM)". In general, the TAM theory was popularized by expert named Davis in 1989. Lucky Oghenetega Urchiewhu and Daniel

Emojorho put it simply about the TAM theory, that The Technology Acceptance Model (TAM) is information systems theory that models how users come to accept and use a technology. The suggests that when users model is presented with a new technology, a number of factors influencing their decision about how and when they will use it. These factors are behavioral intentions, attitude and usefulness of the system, perceived ease of use of the system, individual intention and facilitating or organizational conditions [8]. Through The Technology Acceptance Model (TAM), it is known that the acceptance of sustainable mining technology depends on the two main beliefs. The belief is that is "perceived usefulness" by Fred D. Davis said as "the degree to which a person believes that using a particular system will enhance his or her job performance", while for "perceived ease of use", Davis said in contrast, referring to the degree to which a person believes that using a particular system would be free of effort. This follows from the definition of "ease": "freedom from difficulty or great effort." Effort is a finite resource that a person may allocate to various activities for which he or she is responsible "[9]. If described in the form of illustrations, are as follows:

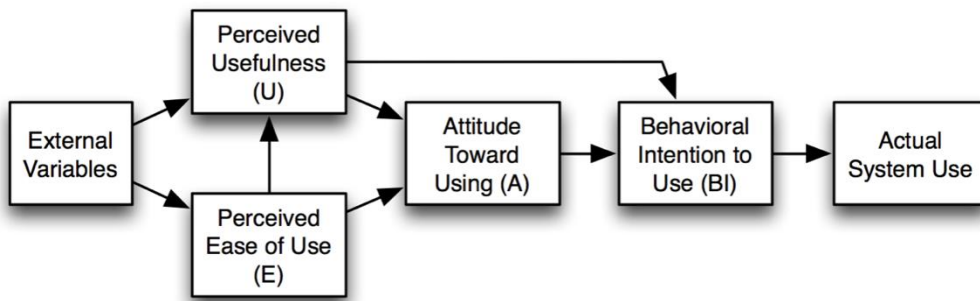


Figure 2: The Technology Acceptance Model (TAM)

The concept of sustainable development in the context of mining management requires that it pay attention to social, environment and economic sustainability. Therefore, acceptance of "green technologies" is something that must be immediately realized in the context of law. Law Number 4 of 2009 concerning Mining must immediately include the technology as a condition to be able to carry out mining management activities in Indonesia. The application of green technology in the future national legal framework is intended to ensure that the rights to mining resources in Indonesia are accessible to current and future generations. This was also conveyed by D. Danelski in his writing that as the world's population increases, demand for resources and infrastructure are equally increased. The adoption of green technologies and sustainable development practices companies meet their current demands and support economic growth without compromising the ability of the future generation to satisfy its needs [10]. The importance of implementing "green technology" in general is built on the awareness in the form of 'Pollution prevention pays.' 'Zero tolerance for fatalities.' 'Zero tolerance for violations.' 'Think green and save the environment.' 'Clean up spills immediately, because good Housekeeping practice pays. " Zero reportable environmental, community and personal accidents and injuries' [11]. As an ingredient in comparing countries that have adopted a mining management approach using "green technology," among others, is Ghana. The following table shows the "green technology" approach adopted.

Table 1 Technology Acceptance Model (TAM):
Trend of adoption of green mining technologies

Area	Traditional Approach	Green Mining Technology Approach
Energy	The CAT 336D / 336E excavators: energy-intensive, wreaking negative effects on the environment, causing energy-poverty problems.	The CAT 336E H Hybrid Excavator now adopted: uses up to 25 percent less fuel per hour than the standard 336E and up to 50 percent less fuel per ton of material moved than its predecessors
Water	Mining operations use water for a number of applications, thereby reducing quality and quantity of water available downstream for aquatic ecosystem, industrial and municipal water uses	Installation of wastewater treatment technologies aim at reducing environmental impact of human and industrial wastewater. Use of dust suppression solutions
Land	Traditional mining operations lead to 25 percent of Ghana's land highly degraded.	Green machinery and green activities now play a major role in restoring and reclaiming lands, improving ecosystem health and increase land productivity.
Safety	Frequent and fatal accidents in the mines partly due to drunkenness	Installation of the lion Alcolmeter DS 400: an electronic breath alcohol detector
Mine Waste	Solid waste, mine water and air particles are generated through mining activities with potentials of polluting the environment.	Caterpillar manufacturing facilities have recalled more than 500,000 tons of materials that might have otherwise been scrapped or gone to a landfill. Adoption of process re-engineering technologies such as R2 (Re-Use and Reprocess), waste is now becoming a raw material, hence reducing waste production.

Source: Rufai Haruna Kilu and Robert Lawrence Afutu-Kotey

CONCLUSION

Based on the results of the study it is known that in the perspective of positive law there is no norm in the Law on Mineral and Coal Mining which explicitly regulates the obligation to use sustainable mining technology. Therefore, for all mining players to use the technology, the Mineral and Coal Mining Law must formulate it explicitly.

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