Proceeding Paper

Study on Waste Management Focusing on Sustainable Issues †

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Abstract: The safe and appropriate disposal of waste generated during mining operations makes mining waste management a crucial concern for the mining sector. This waste includes waste rock, tailing, and other mining wastes that can cause health and environmental issues if improperly managed. To avoid this issue, challenges in sustainable waste management were studied and DEMATEL analysis was conducted.

Keywords: waste generated from mines; DEMATEL analysis; challenges

1. Introduction

Due to the implementation of sustainable practices and strategies in mining industries, waste generation is reduced. The recycling and reuse of waste in the mining industry can mitigate the negative effect of mining waste on the Earth. The proper utilization of mining wastes can ensure that people live in a pollution-free environment. Hudson-Edwards et al. [1] reported on undesirable mining waste found near a mining site used for landfill. Frank et al. [2] reported on how the sustainable use of mining waste can prevent future issues. Lèbre et al. [3] indicated that metal mining wastes are hazardous.To reduce the negative effects of waste management, sustainable waste management practices are implemented, as detailed in [4].

2. Research Methodology

An extensive literature review was conducted to investigate the waste management techniques used in mining industries. There are many challenges reported by mining industries. The most important challenges are the following:

➢ The reuse of produced tailing waste;
➢ Reductions in the environmental impact of mining waste on life;
➢ The lack of advanced technology for waste utilization and segregation;
➢ The lack of a regulatory framework.

Then, the DEMANTEL method was implemented to find a casual relationship between sustainable mining waste challenges.

3. Results and Discussion

The scale of the DEMATEL method is as follows: 0 = no effect; 1—small effect; 2—medium effect; 3—high effect; 4—very effective. Tables 1–5 show the DEMATEL steps, and Figure 1 depicts a cause and effect diagram. In Table 1, the effects of sustainable waste management are mentioned. Table 2 shows the normalized matrix. Table 3 shows direct and indirect relationship matrix and Table 4 shows the total relation matrix and Table 5 the prioritization factor matrix respectively.

Table 1. Effect of Sustainable waste management.

	Direct	Relation	Matrix		
	MW	**EI**	**RF**	**TL**	**sum**
MW	0	3	4	4	11
EI	0	3	1	3	7
RF	4	3	0	4	10
TL	2	3	4	0	9

Table 2. Normalized Matrix.

	MW	**EI**	**RF**	**TL**
MW	0	0.272727273	0.363636364	0.363636364
EI	0	0.272727273	0.090909091	0.272727273
RF	0.4	0.3	0	0.4
TL	0.222222222	0.333333333	0.444444444	0

Table 3. Direct–indirect relation matrix.

	MW	**EI**	**RF**	**TL**
MW	1	0.272727273	0.363636364	0.363636364
EI	0	0.727272727	0.090909091	0.272727273
RF	0.4	0.3	1	0.4
TL	0.222222222	0.333333333	0.444444444	1

Table 4. Total relation matrix.

Total Relation Matrix $T = Y$ (inverse(I-Y))				**Ri**
1.869077529	1.448113468	1.586593974	1.65557726	6.559362231
0.841944126	0.957520092	0.964026024	1.102946804	3.866437045
1.197665519	1.547072331	1.003827019	1.403941829	5.152506698
1.199770379	1.414466131	1.098737084	1.121699196	4.83467279
5.108457553	5.367172022	4.653184101	5.284165089	

Table 5. Prioritization factor matrix. All the values in matrix, which are smaller than threshold value (1.229930344) are set to zero, meaning that the causal relation mentioned above is not considered.

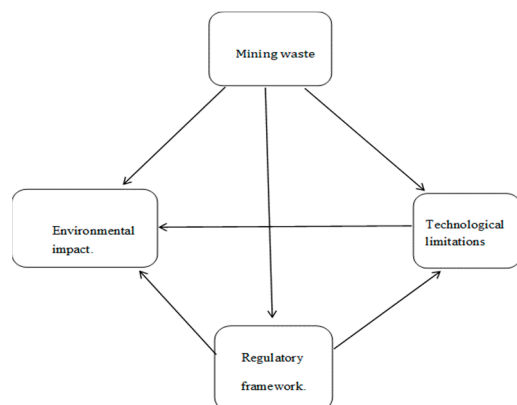|	**MW**	**EI**	**RF**	**TL**
	1.139077543	**1.888105628**	**1.28131326**	**1.653491772**
	0.761944253	0.987520058	0.910402602	1.01292946
	1.237665519	**1.484707234**	1.12038270	**1.41239418**
	1.199770379	**1.414466131**	1.098737084	1.121699196
threshold (aplha) value	**1.229930344**			

Figure 1. Cause and effect diagram.

4. Conclusions

Finally, sustainable waste management is a critical concern in the mining industry given the significant environmental effects of mining activities. Comprehensive waste management programs are necessary for mining companies to minimize their negative environmental effects and increase sustainability. According to research on sustainable waste management in the mining sector, using a mix of approaches works best. The use of cutting-edge waste treatment and disposal technologies, along with waste reduction, recycling, composting, and other waste diversion initiatives, are some of the strategy for waste management. DEMATEL analysis offers important insights into the specific elements of waste management plans that best support sustainability.

References

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