KABARAK UNIVERSITY
6TH ANNUAL INTERNATIONAL RESEARCH CONFERENCE

An assessment of the impacts of gypsum mining on water quality in Kajiado County, Kenya

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20/07/2016

Introduction / Background

1. Increased mining activities in Kenya, targeting titanium, gypsum gold to name a few
2. Extractive industry is potentially an important contributor to water pollution

Statement of the problem

i. Gap in the analysis of effects of gypsum mining on water quality
ii. Gypsum mining literature on water quality effects lack in details
iii. If nothing is done water pollution and consequent health effects might increase

Study objectives

The study sought to Investigate the Impacts of gypsum mining operations on the quality of water quality in Kajiado County

Brief literature review

water impacts could those that lead to a decline in the quality of natural water, making it unsuitable for use

The alteration of biological, Physical and chemical properties of water (Magombedze, 2006).

Brief literature review

- water related impacts can arise at nearly every stage in the mining process (Miranda and Sauer,2010)
- Changes in parameters above acceptable levels can result in serious health challenges to the local population (Odira *et al*, 2012; Ternjej *et al*, 2014).

Brief literature review

- The level and type of water contamination depends on the nature of mineralization, mining methods and processing chemicals
- Most critical changes occur as a result of leaching from stock piles and point discharges of mine drainage (Mestre, 2009; Nude *et al*, 2011).

Methodology

- Primary data obtained using interviews, questionnaires and field measurements.
- Samples taken at selected sites and subjected to physical, chemical and bacteriological examinations
- Secondary data collected by reference to public health records on disease incidence in the study area

Findings / Results

- **B**acteriological analysis revealed higher Coliform concentrations in surface water samples than those observed in ground water samples.
- Mean total coli form in the surface water samples was 555/ 100 ml (allowed 3)

Findings / Results

- Bacterial pollution in water provides evidence of recent faecal pollution
- Contamination confirms the influence of anthropogenic activities near the mine ponds (WHO, 2006; Attia, 1999).

Findings / Results

- insignificant elevation in the concentrations of trace metals pollutants in ground water samples.
- Surface water parameters exceeded the WHO (2006) recommended guideline values for the specific parameters
- Nitrates in surface water samples was 10.1 mg/L while nitrates concentration in ground water was 1.74

Parameter	Units	Mean	Median	Min.	Max.	NEMA Value
PH	pH Units	8 ± 0.08	8.010	7.400	8.660	6.5 – 8.5
Turbidity	N.T.U	80.10 ± 0.57	121.5	1.380	156	-
Conductivity	µS/cm	28203 ±3664	27422	2429	48830	-
Total Hardness	mg/L caCO3	1102 ± 24.29	1124	952	1252	-
Nitrates	mg/L NO3	10.12 ± 0.41	10.3	6.800	12.7	10
TSS	mg/L	878 ± 189.25	598.5	100	2370	1200
Total Coli forms	per/100 ml	555 ± 167.93	180	75	2400	-
E-Coli	Per/100 ml	47.8 ± 10.16	30	7	150	Nil
Zinc	Zn mg/L	0.033 ± 0.01	.015	.01	.002	1.5
Cadmium	Cd mg/L	0	0	0	0	0.01
Lead	Pb mg/L	0	0	0	0	0.05
Copper	Cu mg/L	.024 ± 0.02	.015	.01	.03	0.05

Findings / Results

relationship between probable water contamination and disease incidence

waterborne diseases including diarrhoea, dysentery, typhoid fever and intestinal worms accounted for 20.3% of the under 5 year old cases

No significant difference in the disease burden for children aged below 5 years and the rest of the population ($p \leq 0.206$).

Conclusions

1. water samples collected from mine pits, confirm presence of bacterial organisms including E-coli
2. water resources near mining sites were so unsafe that they escalated disease outbreaks in the affected communities
3. The elevated bacterial levels are more of an indirect impact of gypsum mining on water resources than a direct one

Recommendations

The study recommends training and extension services aimed at prevention of diarrheal and other waterborne diseases

Areas for further study

A geological survey in the study area to determine trend changes on water table since the inception of mining in Kajiado County

References

- **Al-Harthi, A. A. (2001).** Environmental impacts of gypsum mining operations at Maqna area, Tabuk, Saudi Arabia. *Environmental geology,* Vol. 41(1-2) 209-218.
- **Akabzaa, T. M.; Banoeng-Yakubo, B. K. and Seyire, J. S. (2007).** Impact of mining activities on water resources in the vicinity of the Obuasi mine. *West Africa journal of applied zoology*, Vol. 11(1) 101- 108.
- **Magombedze, C. (2006).** *Geochemical processes controlling the generation and environmental impacts of acid mine drainage in semi arid conditions. A case study of sulphide metal mines in Zimbabwe*. PHD dissertation, Norwegian university of science and technology.

Republic of Kenya (RoK) (2006). *Environmental Management and Coordination Act (EMCA): Water quality regulations.* Nairobi. Government Printer