

## The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone



Hassan Elsan Mansaray<sup>1</sup>, Dr. Victor Tamba Simbay Kabba<sup>2</sup>, Prof. Hebert Borboh Kandeh<sup>3</sup>,  
Dr. Abdulai Sillah<sup>4</sup>

<sup>1</sup>Department of Human Resource and Management, Institute of Public Administration and Management (IPAM), University of Sierra Leone

<sup>2,3</sup>Institute of Geography and Development Studies, School of Environmental Sciences, Njala University

<sup>4</sup>Institute of Geography and Development Studies, School of Environmental Sciences, Njala University; Bank of Sierra Leone

**ABSTRACT:** To effectively determine the environmental and social impacts of mining on local communities in Tankoro chiefdom, the researcher applied a mixed methods research methodology to perform the study. The study applied methods in the data collection that consist of, questionnaire interviews through Kobo Collect and focus group discussion. The sample size was 393 respondents. The study discovered that the local communities where the mining activities are carried out suffer negative effects on the environment together with the society. Nevertheless, Koidu Holdings had tried to decrease the negative impacts of mining operations on the affected communities due to uncompromising concerns among the affected communities. It had also constructed new markets, a Primary Health Unit (PHU), building of relocated schools, renovation of old schools, provided scholarships to students at all academic levels and has supported schools with educational resources as well as dug some boreholes, mainly in Kanniya resettlement community, which served as a drinkable water, to help reduce the sternness of water crisis.

**KEYWORDS:** Mining, Environment, Social, Minerals, Communities.

### 1.0 INTRODUCTION

Africa has seen a speedy rise in the scale of mineral mining in previous years. Besides, in the 1980s and 1990s, the sector saw a fast liberalization, making opportunities mainly for western multinational companies to invest in large-scale mining, and strengthening the anticipations that countries might utilize their mineral wealth for national development purposes. The rise and later drop in mineral prices have given countries and companies a palate of the huge economic prospective of mining in Africa. Until now, it has as well exposed a lot of the structural problems of mining in the perspectives of feeble organizations and extremely relaxed forms of governance. Price instability means companies and governments are confronted with soaring expectations they frequently cannot bump into. Similarly, deceit and cloudy agreements are usual, also local development influence is time and again more obscure than was expected. This then and there leads to pressures and possible conflict between companies, communities and authorities over access to resources as well as its management that might lead to environmental degradation and hindered development at large (Medinilla and Karaki 2017).

According to ITA (2020), Sierra Leone is well recognized for its massive bequest in minerals which comprise of diamonds, rutile, bauxite, gold, iron ore, limonite, platinum, chromite, coltan, tantalite, columbite and zircon, in addition to a favourable petroleum prospective. In the 1990s, the 11-year civil war sponsored with revenue from the minerals sector overwhelmed the country, which brought about extensive killing, devastation of infrastructure and an austere reduction in the economy. The sector was also seriously pretentious by the double shockwave of the drip in iron ore prices and the Ebola endemic in 2014. It is evident that mining has been the backbone of the economy ever since independence and the Government of Sierra Leone has stayed greatly reliant on its mineral resources to support sustainable economic growth over the years.

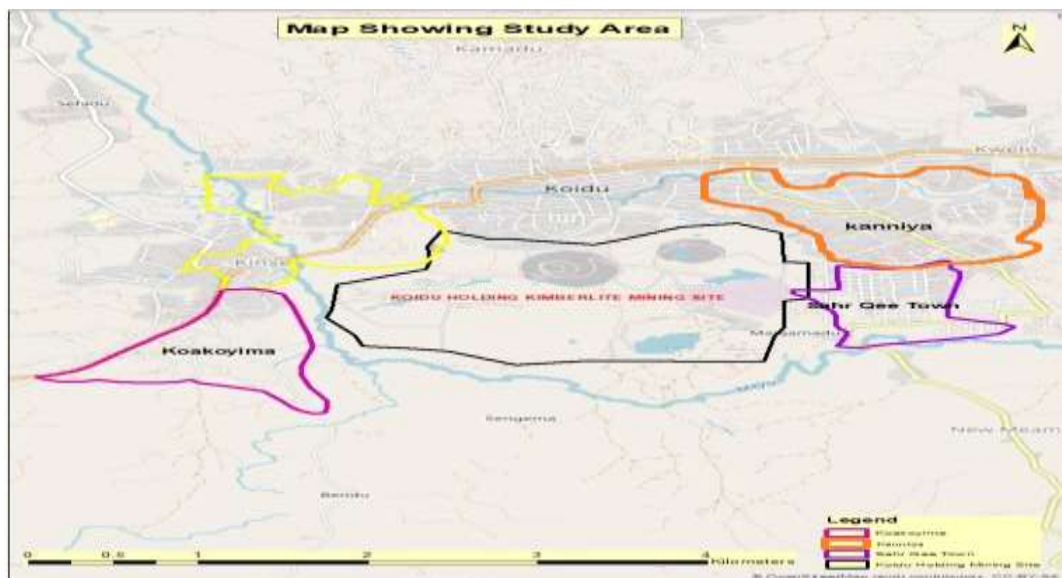
### 1.1 Research Questions

- i) What are the environmental impacts of the mining on local communities?
- ii) What are the social impacts of mining on host communities?

# The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone

## 1.2 The Study Area

The study is demarcated to Kono district, east of Sierra Leone. Kono District is a district in the Eastern Province of Sierra Leone. Its capital and largest city is Koidu City. Kono district is the major diamond producer in Sierra Leone. Because of the notable mining history of Kono, the researcher decided to select Tankoro chiefdom in the Kono district as a case study so as to explore Koidu Holdings impact of mining in the local communities in Tankoro chiefdom. The study was conducted in three communities (Kanniya Resettlement, Sahr Qee Town, and Koakoyima) in Koidu New Sembehun City Kono District, east of Sierra Leone. These three communities have an estimated population of 21,398 projected from the 2015 population and Housing census (Kanniya Resettlement 7,846, Sahr Qee Town 5,090, and Koakoyima 8,463). The purpose was to get different views and opinions from diverse respondents (Statistics Sierra Leone 2022).



## 2.0 REVIEW OF RELATED LITERATURE

This study reviewed the following below in line with the research questions.

### 2.1 Local communities and mining

One of the most undesirable impacts of mining is the physical dislocation of thousands of people for undertaking mining operations in their habitation areas. This is an enormous challenge for human rights and poses colossal social danger. As described by Downing (2011), in India the displacement because of mining accounted to over 2.55 million people between 1950 and 1990 as a result of mining activities. The displacement which forces whole communities to move somewhere else is not only restricted to losing their homes, but likewise their land, and livelihoods. The relocation of displaced communities is typically in areas without sufficient resources and areas close to mining operations occupied with pollution and uncleanness. Involuntary resettlement can be mainly devastating for local communities who have sturdy cultural and spiritual relations to the lands and forest of their ancestors and who might find it problematic to survive when these are broken in Jharia Coalfields dislocation is still a grave issue for their suitable recuperation as discovered in their study (Singh et al 2015).

### 2.2 Environmental and social impacts of mining

Carvalho (2017) observed one important aspect in all mining projects, which is the risk assessment of mine operations bordering human settlements. Formerly, in European countries for instance, it was common to see mines and cities as well as their activities entwined in a small area. It was the case for instance, the Ruhr basin in Germany, Loire in France together with West Midlands (Birmingham) in UK, which were very old mining regions. In recent years, the regulations and apprehensions of environmental resources lead to the moderation of pollution and rectification of the environmental impact. One good case is the Erzgebirge (Ore Mountains) in Saxony, Germany, close to the border with Czech Republic, where initially silver and related base metals and later uranium was mined to supply the URSS nuclear programme. Through Germany reunion in 1991, a large environmental remediation programme started that intricate cleaning of polluted areas, radioactive waste incarceration, installation of mine water treatment plants, and reconstruction of the countryside and villages. Rectification was required since the exposure of large communities to radiation and radioactive waste is not tolerable consistent with present radiation protection standards (IAEA, 2014).

## **The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone**

A study on the favourable social and economic impacts of diamond mining on local communities in Sierra Leone was conducted by NMJD in the summer of 2020. According to their research, there are subpar living conditions in mining regions as well as a number of problems that the locals associate with mining, including gender-based violence, teenage pregnancies, the dropout of girls from school, a lack of and high cost for basic foods, environmental degradation, such as contaminated water basins and abandoned pits that act as breeding grounds for disease-carrying mosquitoes, and dishonest landowners. People in the study areas who live in communities where diamond mining has an influence typically think that mining has little socioeconomic benefits. Focus groups found that the communities had only seen minor infrastructural improvements and poorly paying jobs for young people (NMJD 2020)

Contrary to what Koidu Limited asserted when they gained control of the Koidu Kimberlite Mine in Sierra Leone, this shows a lack of compliance in minimizing the negative consequences of mining on the impacted ecosystem. It assured residents of the Gbense and Tankoro Chiefdoms that forthcoming mine expansions would boost local prosperity and provide jobs. It promised to ensure that any impacted community members would receive new residences at a safe distance from the mine in accordance with strict environmental requirements in order to lessen the harm caused by the mine. However, the predicted profit was never realized by the community. Instead, it has not benefited economically or socially from diamond mining and has been disproportionately impacted by its negative repercussions. They were evicted from their homes by Koidu Limited, and many families have been waiting to be relocated for more than ten years. Debris from daily mine blasts pours over their rooftops and onto their farmland. Locals are unable to cultivate their homesteads. This is also because the massive heap of mining waste that stands over Koidu has buried some of the inhabitants' fields. Their land is no longer fertile since mining activities have depleted water supplies and are discharging harmful substances into their soil. Residents assert that the mine is to blame for their lung problems, high blood pressure, gastrointestinal problems, migraines, and other health problems. In response to community protests about the company's working conditions and environmental harm, Koidu Limited called the police, who then shot and killed four individuals, including a 12-year-old boy (EarthRight International 2021).

Similarly in Sierra Leone, in recent years, the regulations and anxieties about environmental resources have led to the control of pollution and enhancement of the environmental impact. This was done through an appeal to Oxfam (the Columbia Center on Sustainable Investment), that carefully chose provisions in the Mines and Minerals Act 2009 and reliable policy statements from the Minerals Policy 2018 to offer recommendations on how to best support the anticipated new mining law with international best practices. The succeeding topics were revised: fiscal regime, climate change, access to and use of land, community consultations and participation, human rights together with the community development agreements. The team finished a desk-top appraisal of the following laws and policies: Mines and Minerals Act 2009, Mines and Minerals Regulations 2009, Minerals Policy 2018, Local Government Act 2004, the Sierra Leone Environment Protection Agency Act 2008, Environmental and Social Regulations for the Minerals Sector 2012, the Income Tax Act as amended by the Financial Act 2015, the Finance Act 2016, the Extractive Industries Revenue Act 2018 and the Financial Act 2019. As, the Minerals Policy has been prepared as part of series of legal, regulatory and institutional reforms introduced by the Government to make sure that Sierra Leone make the most benefits from its mineral resource endowments. By extension of these reforms, the core Minerals Policy of 2003 is now replaced by the Sierra Leone Minerals Policy of 2018. The policy is a more thorough document that considers international, continental and regional initiatives relevant to mineral sector governance and management. It also captures modern developments in the mining sector in Sierra Leone and places the mineral sector at the heart of achieving Sierra Leone's long-term vision for sustainable growth and transformational development (SLMP 2018, Mebratu-Tsegaye et al 2020).

### **3.0 RESEARCH METHODOLOGY**

This study utilized a single case study analysis methodology. The researcher possessed the necessary skills and expertise to thoroughly explore the case, allowing for the observation of data within the case analysis and the generation of a cross-case analysis (Yin, 2003). The selection of a case study method was deemed appropriate for this study, as it facilitated the researcher's ability to provide a narrative regarding the communities affected by the operations of Koidu Holdings (Yin, 2014). To ensure a representative sample, a Probability Size (PPS) technique was employed to select participants from the communities impacted by the mining activities, specifically the Kanniya Resettlement, Sahr Quee Town, and Koakoyima (sampling units) within the Tankoro Chiefdom (sampling frame). Consequently, a total of 392 respondents were included in the sample. It is worth noting that a sampling unit refers to the individual or object being observed, while a sampling frame encompasses the entire population from which individuals or objects can be observed (Ullah, 2013). The distribution of the questionnaire was based on the proportional allocation of sampling units, in accordance with the 2021 projected population data for Tankoro Chiefdom in the Kono district as follows:

## The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone

### Respondents Distribution according to sampling units

Mining sampling units in Tankoro Chiefdom	Respondents	Percent
Kanniya Resettlement community	144	37%
Sahr Qee Town community	93	23%
Koakoyima community	155	40%
<b>TOTAL</b>	<b>392</b>	<b>100%</b>

Researcher's study data 2022

### 3.1 Stratified sampling

Stratified sampling permits the researcher to draw additional thorough decisions by guaranteeing that every single smaller group is accurately represented in the sample. In order to apply this sampling technique, the researcher classifies the dissimilar categories of people that constitute the target population and works out the amounts required for the sample to be representative. Equally, it is much comfortable to stratify a population on the basis of gender than on the basis of age, income or attitude (Kumar 2011; McCombes 2019; McLeod 2019). In this situation, the researcher went more to split the groups by gender. So, the succeeding proportional gender allocation were adult participants as follows: 73 males, 71 females' proportional allocation was made for Kanniya Resettlement; 46 males, 47 females for Sahr Quee Town and; 78 males, 77 females for Koakoyima, totaling **392** respondents. As a result, the percentage of the population being sampled was **1.83%**. That is: Total population = 21,398

Sample size = 392

Cluster group =  $\frac{21398}{392} = 54.5\%$

392

$54,5867 \times 392 = 21,398$

% sampled =  $\frac{392}{21398} \times 100 = 1.83\%$

### 3.2 Ethical Issues

According to Orb et al (2000) any research that consist of people needs awareness of ethical issues. Cohen et al (2007) stated the importance of keeping ethical behaviour when carrying out research. Therefore, researchers require to have respect for local traditions, customs, norms, and values. Participants must be informed of the reason and nature of the study so that they are in the position to give an informed consent to participate in the study. Participants should also be knowledgeable that their participation is voluntary, and they can choose to withdraw from the study at whatever time. The data provided by the participants were interpreted honestly without misrepresentation. In understood of that, interviewees were assured that their responses would be nameless. It was made clear to them that their responses are only going to be used for the purpose of the study.

## 4.0 DISCUSSION OF FINDINGS

In order to draw a decision, the researcher sought input from the residents of Kanniya Resettlement, Koakoyima, and Sahr Quee Town their opinions regarding the environmental and social effects brought on by the company's investments in mining in the focal mining communities. The study found out that the operations of Koidu Holdings mining company has serious environmental impact on the affected mining communities in Tankoro chiefdom which have caused the following effects based on the findings:

### I. Land degradation

The results of the study indicated that 63(16%) said, air pollution, 83(22%) degradation of land and vegetation, 22(6%) Noise pollution, and 39(10%) water pollution are the causes of land degradation. Even though mining is a key component of the economies of many developing nations, there is evidence that all mining operations have a negative impact on the environment. It worsens farmland to terrible conditions, random vegetation loss, and river sedimentation. However, improper mining techniques are primarily to blame for the destruction of the environment that mining activities produce (Oviir and Utouh 2010; Measham et al 2013, Boadi et al 2016, Bansah et al 2018).

## **The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone**

### **II. Deforestation**

Because of the mining company's methods of operation that had caused negative effects on the environment; 78(20%) said Koidu Holdings had compensated the affected communities - provided alternative sources of drinking water, resettled the affected communities, constructed relocated schools, re-afforested areas long deforested, and reviewed methods of operation. Although the mining company has taken efforts to minimize the environmental damage adequately and operatively; a majority of the respondents which are 353(91%) are still not satisfied with the said improvement, though 33(9%) expressed satisfaction with the attempt. Accordingly, diamond mining had resulted in adverse effects on the landscape and ecosystem at large in the study areas. Mineral extraction has long been connected to widespread deforestation, degraded soil, and environmental contamination in the Tankoro chiefdom. In addition to the pervasive environmental disruption, lost agricultural land, inadequate water accessibility, and deforestation (NACE 2009, NMJD 2010, Human Rights Watch 2014).

### **III. Siltation of waters**

There has been undesirable increase in concentration of deposition of water-borne silt in body of water in the affected communities due to the mining activities. As said by Awudi (2002), the extractive industries are mostly to blame for land degradation, waste management, deforestation, and the spread of chemicals in rivers and streams, which lowers the quality of the water that humans drank. Garvin et al. (2009) expressed that that alternate sources of drinking water were insufficient in some mining communities where water scarcity was brought on by contamination of water sources. The deliberate or unintentional release of chemicals and waste water during the processing of minerals could lead to erosion, contamination, and changes in water flow as a result of increased surface or groundwater removal.

### **IV. Soil/land/Water pollution**

There is air pollution, land and vegetation deterioration, noise pollution, water contamination, attacks from the blast and destruction of the land, flooding, and other impacts, according to 212 (55%) respondents. Water was obtained via boreholes, wells, pipes, local streams, and rain in the impacted communities. There is a serious water deficit in the mining areas as a result of mining activities. Garvin et al. (2009) also noted that alternate sources of drinking water were insufficient in some mining communities where water scarcity was brought on by contamination of water sources. The deliberate or unintentional release of chemicals and waste water during the processing of minerals could lead to erosion, contamination, and changes in water flow as a result of increased surface or groundwater removal, all of which could have a significant impact on the amount of water available. But in addition to using a lot of water, mining and related activities frequently have an effect on the local hydrological system and the quality of the water as well.

Nevertheless, 91% of respondents are still dissatisfied with the ostensible improvement, despite the mining company's efforts to reduce environmental damage operationally. Nonetheless, 9% of respondents expressed satisfaction with the endeavour. As a result, diamond mining had a negative impact on the study areas' overall environment and ecosystem. This demonstrates the reason why 68% of the respondents in the three affected communities do not support mining in the Tankoro communities, because of some of its negative effects. Even though 32% of the respondents however supported mining in the communities owing to its expected rewards such as employment opportunities and socioeconomic benefits (construction of markets, schools, recreational centres, and hospitals) as the case may be.

On the socio-economic factor, the following were discovered during the study:

#### **I. Livelihoods/Education/Infrastructural development**

The 29% of the respondents' further trust that mining can bring significant social and economic benefits to their mining communities - Kanniya, Koakoyima, and Sahr Quee Town in the Tankoro chiefdom. But 13% of the respondents believe that mining will upset their livelihoods. However, 58% remained neutral; as they are not sure of the benefits or undesirable impacts the mining might cause in their communities. Walser and Limi's assumptions may be somehow correct about the positive and negative impacts of mining in developing nations like Sierra Leone. When they earlier observed that mining has made a constructive impact on the economy of many countries and, can be measured in relation to employment and income generation. But also perceived that these benefits do not manifest immediately (Walser 2000; Limi 2007).

Nevertheless, the most positive cases that the study discovered were linked to the expansion of local small and micro enterprises' activities and other support towards education. These include:

- Petty traders/businessmen/merchandise will benefit from sales made from their goods and services
- Construct roads, schools, houses, markets, Wells/borehole Pipe-borne water, and community centers
- Create employment opportunities for residents
- Provide scholarships for school students as well as college students in the affected communities



## The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone

- Support education through the provision of school materials like books, pens, and stationeries, together with refurbishing schools.
- Building standard classrooms, and awarding scholarships to students for higher learning
- Assist in the training of teachers to improve their teaching skills
- Provide health support to hospitals like beddings, drugs, and other material assistance.

However, 99% of the respondent in the three communities believed that there was no monitoring, management, and supervision of the company mining activities. This condition will certainly interrupt more activities like agriculture and plantations along with disrupting people's survivals. Yet, communities impacted by mining are habitually excluded from the mining earnings and benefit-sharing (Rutenge 2016; Sukri et al 2020).

Besides, a focus group discussion (FGD) was held as a result of the process's ability to provide thorough information about the environmental and regulatory issues. Six people were involved in the discussion. 3 Traditional leaders and 3 Youths were selected from the three affected communities (Kanniya Resettlement, Koakoyima and Sahr Quee Town). These groups were involved to provide a diversity of viewpoints on the subject. The FGD discussed the environmental and social impacts of mining in the affected communities. It was resolved that Koidu Holdings has planted trees and gave locals, tree seedlings to plant in their neighbourhoods in an attempt to protect the environment. The Koidu Holdings Company has dug some boreholes, mainly in Kanniya resettlement community, which served as a drinkable water, to help reduce the sternness of water crisis. It has similarly implemented other measures, such as repetitive watering of important roads inside the communities to reduce air pollution caused by increased dust release. Although much has to be done by the mining company according to the FGD to lessen the environmental impacts.

### 5.0 CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

As a result, the study concluded that mining had a negative impact on the ecosystem. The study further discovered that the local communities where the mining activities are carried out suffer negative effects on the environment together with the society. Therefore, action must be taken now before social and environmental problems spiral out of hand. This is crucial because, despite numerous attempts and efforts, the effects of mining operations still present serious challenges, particularly for locals and, to a greater extent, the general public in the mining area.

#### 5.2 Recommendations

The following recommendations are given in light of the study's findings:

To reduce environmental harm and pollution, the government should equip the EPA and the Ministry of Mines and Mineral Resources together with agencies involved in mining supervision with the necessary resources to constantly gather fundamental environmental information. Also, to lessen the damaging environmental effects of mining in those communities, these organizations must enhance their monitoring efforts and implement legal obligations.

To ensure environmental compliance by the Koidu Holdings mining company and to participate in environmental governance, which might be accomplished by forming environmental oversight groups in mining communities. In mining peripheral communities, there should be efforts to raise awareness of environmental issues and provide environmental education in order to strike the right balance between development and economic growth and the need to maintain environmental standards for community life expectancy.

### REFERENCES

- 1) Awudi, G.B. (2002), The role of foreign direct investment (FDI) in the mining sector of Ghana and the environment. In Proceedings of the Conference on Foreign Direct Investment and the Environment, OECD, Paris, French, 7–8 February 2002.
- 2) Bansah, K.J., Dumakor-Dupey, N.K., Kansake, B.A., Assan, E. and Bekui, P. 2018, Socioeconomic and environmental assessment of informal artisanal and small-scale mining in Ghana. *J. Clean. Prod.* 2018, 202, 465–475.
- 3) Boadi, S.; Nsor, C.A., Antobre, O.O. and Acquah, E. 2016, An analysis of illegal mining on the shelter belt forest reserve, Ghana: Implications on community livelihood. *J. Sustain. Min.* 2016, 15, 115–119
- 4) Carvalho F.P. (2017), Mining industry and sustainable development: time for change © 2017 The Author. Food and Energy Security published by John Wiley & Sons Ltd.
- 5) Cohen, L., Manion, L., and Morrison, K. (2007), *Research methods in education* (6<sup>th</sup>ed.). London: Routledge.
- 6) Downing, T.E. (2011), *Avoiding New Poverty: Mining Induced Displacement and Resettlement*, IIED and WBCSD, London,

## The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone

- 2002, Research Paper No. 58, pp. 3; S. Somayaji, S. Talwar (eds.), *Development-induced Displacement, Rehabilitation and Resettlement in India*, Routledge, 2011, pp. 94.
- 7) EarthRights International (2021), Annual Report <https://earthrights.org/publication/2021-port/>
  - 8) Garvin T., McGee T.K., Smoyer-Tomic K.E., Aubynn E.A. (2009) Community–company relations in gold mining in Ghana. *Journal of environmental management*
  - 9) Human Rights Watch 2014, *Whose Development? Human Rights Abuses in Sierra Leone’s Mining Boom 2014*. <https://www.hrw.org/report/2014/02/19/>
  - 10) IAEA (2014), *Radiation protection and safety of radiation sources: international basic safety standards*. IAEA Safety Standards Series No. GSR Part 3. International Atomic Energy Agency, Vienna.
  - 11) ITA (2020), *Mining and Mineral Resources*. Published by the International Trade Administration, US Department of Commerce 1401 Constitution Ave NW, Washington, DC 20230 Last published date: 2020-07-29
  - 12) Kumar R. (2011), *Research Methodology, a step-by-step guide for beginners*. SAGE Publications Ltd 1 Oliver’s Yard 55 City Road London
  - 13) Iimi (2007), *Escaping from the Resource Curse: Evidence from Botswana and the Rest of the World*. 2007\_IMF Staff Papers Vol. 54, No. 4 & 2007 International Monetary Fund.
  - 14) McCombes S. (2019), *Sampling Methods | Types and Techniques Explained*. Published on September 19, 2019. <https://www.scribbr.com/methodology/sampling-methods/>
  - 15) McLeod, S. A. (2019), *Sampling methods*. Simply Psychology. [www.simplypsychology.org/.html](http://www.simplypsychology.org/.html)
  - 16) Measham, T.G., Haslam M. F., Moat, K. and Franks, D.M. (2013) An expanded role for the mining sector in Australian society? *Rural Soc.* 2013, 22, 184–194.
  - 17) Mebratu-Tsegaye T., Toledano P. and Thomashause S. (2020), *A Review of Sierra Leone’s Mines and Minerals Act*. Columbia Center on Sustainable Investment
  - 18) Medinilla A. and Karaki K. (2017), *Between global and hyperlocal: A territorial approach to partnerships in mining in GREAT Insights Mining for development*. Published by ECDPM Editor: Sanoussi Bilal, [sb@ecdpm.org](mailto:sb@ecdpm.org)
  - 19) NACE 2009, *National Advocacy Coalition of Extractives, Sierra Leone at the Crossroads: Seizing the Chance to Benefit from Mining*; NACE: Freetown, Sierra Leone, 2009.
  - 20) Nguyen N.B, Boruf B. and Tonts M. (2019), *The Regulatory Framework and Minerals Development in Vietnam: An Assessment of Challenges and Reform*. *Sustainability* 2019, 11(18), 4861; <https://doi.org/10.3390/su11184861>
  - 21) NMJD (2020), *Sierra Leone: Benefits of diamond mining to local communities?* Network Movement for Justice and Development.
  - 22) NMJD (2010), *Network Movement for Justice and Development. Diamonds, Blood and Tears: The Relationship between Koidu Holdings Ltd. And the Affected Property Owners of Kono*. Focus on Mining Companies’ Series 2010.
  - 23) Oviir, M. and Utouh, L.S. (2010) *Auditing Mining: Guidance for Supreme Audit Institutions*; INTOSAI Working Group on Environmental Auditing (WGEA): Helsinki, Finland, 2010; pp. 1–59.
  - 24) Orb A, Eisenhauer L and Wynaden D. (2000), *Ethics in Qualitative Research* *Journal of Nursing Scholarship*, 2000; 33:1, 93-96. ©2001 Sigma Theta Tau International. Retrieved from [www.columbia.edu/~mvp19/RMC/M5/QualEthics.pdf](http://www.columbia.edu/~mvp19/RMC/M5/QualEthics.pdf)
  - 25) Rutenge M.M. (2016), *Gold-Mining Multinationals and Community Interaction in Tanzania towards Localised Social Accountability*. This dissertation is part of the Research Programme of CERES, Research School for Resource Studies for Development. Funded by the Netherlands Fellowship Programme (NFP).
  - 26) Singh, A.N., Srinivas, M. And Naik, B.N. (2015), *Forecasting the impact of surface mining on surrounding cloud computing*. *Journal of Computer Sciences and Applications* Vol. 3, No. 6, 2015, pp 118-122. doi: 10.12691/jcsa3-6-1
  - 27) SLMP (2018), *the Sierra Leone Minerals Policy* November 2018. Sierra Leone Government Ministry of Mines and Mineral Resource.
  - 28) Stats SL (2022) *Projected Population at Kanniya Resettlement, Sahr Qee Town and Koakoyima, Tankoro Chiefdom in Koidu City, Kono district - Censuses and GIS Division – Stats SL*.
  - 29) Sukri, Ariana, Ekawaty D., Syam F and Amiruddin A. (2020), *Dilemma of mining: economic development and ecological risks*. IOP Conf. Series: Earth and Environmental Science 575 (2020) 012245 IOP Publishing doi:10.1088/1755-1315/575/1/012245
  - 30) Ullah M.I. (2013), *Sampling Frame and Sampling Unit* Published Sep 27, 2013 <https://itfeature.com/sampling-and-sampling-distributions/sampling-frame-and-sampling-unit>

## The Environmental Impact of Mining on Local Communities in Tankoro Chiefdom, Kono District, Sierra Leone

- 31) Ukaga, O., Ukiwo, U. and Ibaba, I.S. (Eds.) (2012), *Natural Resources, Conflict, and Sustainable Development: Lessons from the Niger Delta*; Routledge: Abingdon, UK, 2012; Volume 8.
- 32) Walser G. (2000), Economic impact of world mining. World Bank Group Mining Department, Washington, D.C., United States of America. IAEA-SM-362/7.
- 33) Yin, R. K. (2014), *Case study research: Design and methods (applied social research methods)*. Thousand Oaks, CA: Sage publications.
- 34) Yin R. K. (2003), *Case study research: Design and methods*. Thousand Oaks, CA: Sage.



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non Commercial 4.0 International (CC BY-NC 4.0) (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.