CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dof Crossref ROAD INDEX COPERNICUS Indonesia OneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

IMPACT OF CHINESE COBALT MINING ON HEALTH AND ENVIRONMENTAL SECURITY OF PEOPLE IN THE DEMOCRATIC REPUBLIC OF CONGO

Volume: 7
Number: 2
Page: 596 - 604

Article History:
Received: 2026-01-28
Revised: 2026-02-20
Accepted: 2026-03-29

Syabina Kheisa Briliana[1], Agatha Mathilda Hutagalung[2], Januari Pratama Nurratri Trisnaningtyas[3]
[1,2,3]University Pembangunan Nasional "Veteran" Jawa Timur, Indonesia
Corresponding author: Agatha Mathilda Hutagalung
E-mail: agathamathilda@gmail.com

Abstract:
The Democratic Republic of Congo (DRC) and its cobalt mining have been in the global spotlight. It is because Congo is a major contributor to the world's supply of cobalt, a critical component in lithium-ion batteries for electric vehicles and electronic devices. In practice, however, mining activities carried out by Chinese companies have serious health and environmental impacts on communities in the DRC. This research aims to describe the health and environmental problems caused by cobalt mining in the Congo, and to provide solutions that can be considered to improve the situation in the DRC. A systematic literature review was used to collect data from scientific journals, reports from international organizations, and other reliable sources. A qualitative analysis was conducted to determine the environmental and health impacts of mining activities. The results show that cobalt mining has caused land degradation, deforestation, and water and soil pollution from toxic waste. Public health is also affected, as evidenced by an increase in respiratory diseases, chronic poisoning and skin disorders due to exposure to hazardous chemicals. This study concludes that stricter regulations, effective monitoring and sustainable approaches are needed to reduce the negative impacts of cobalt mining. Collaboration between the government, companies and local communities is essential to create a responsible and environmentally friendly mining system and ensure the protection of community health and welfare.

Keywords: Cobalt, Environment, Health, China, Democratic Republic of Congo.

INTRODUCTION

The global demand for lithium-ion batteries, which power mobile devices and electric vehicles, continues to rise. It has led to a significant increase in the demand for cobalt, a key raw material for lithium-ion batteries. This situation is driven by the world's efforts to accelerate environmentally friendly technologies. The year 2023 marked a record-high global cobalt production (Cobalt Institute, 2024). Many major projects were underway in 2023, with a significant production increase occurring in Kinshasa, Democratic Republic of Congo (DRC). However, the efforts to reduce global carbon emissions have negatively impacted health and environmental conditions in the DRC.

The DRC is the world's largest cobalt producer, accounting for approximately 70% of global reserves. About 88% of the cobalt in the DRC is produced by industrial mining operations run by the world's largest companies, while the remaining 12% comes from artisanal mining (OPIS Staff, 2023). Due to the high global demand for cobalt, it has become a highly valuable commodity, attracting investments from major producer countries in the DRC. One of the primary investing countries is China. As is widely known, China has experienced rapid economic growth and infrastructure development. China is a major global consumer of cobalt, consuming nearly 87% of the global supply. In the mining sector, China has refined 68% of the world's nickel, 40% of its copper, 59% of its lithium, and, most notably, 73% of its cobalt. As shown in the graph below, China

CATRA RESEARCH INSTITUTE
• ISSN 2720 - 9644 (print)
• ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dof Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

is the largest contributor to cobalt production in the DRC, with a total output of 109,159 tons (Venditti, 2024).

Cobalt Production (tonnes)	Non-Chinese Owned Production	Chinese Owned Production	2030F (Total)	2030F (Share)
DRC	94,989	109,159	204,148	67.9%
Indonesia	23,288	25,591	48,879	16.3%
Australia	7,070	0	7,070	2.4%
Philippines	5,270	0	5,270	1.8%
Russia	4,838	0	4,838	1.6%
Canada	4,510	0	4,510	1.5%
Cuba	4,496	0	4,496	1.5%
Papua New Guinea	541	3,067	3,608	1.2%
Turkey	2,835	0	2,835	0.9%
New Caledonia	2,799	0	2,799	0.9%
ROW	10,336	1,901	12,237	4.1%
Total	**160,974**	**139,718**	**300,692**	**100.0%**

Source: Benchmark Mineral Intelligence 2024

Figure 1. Global Cobalt Production and Chinese Ownership (Current and 2030 Forecast)

According to data from Benchmark Mineral Intelligence as of July 2024 (Benchmark Minerals, 2024), the graph also indicates that the DRC has cobalt mining operations not controlled by China, amounting to 94,989 tons. With this output, it is projected that by 2030, cobalt production in the DRC will reach 204,148 tons, representing 67.9% of the world's total cobalt supply. Apart from the DRC, China has also made significant investments in Indonesia, with a total of 25,591 tons, while Indonesia's independent production stands at 23,288 tons. China also operates cobalt mines in Papua New Guinea, with an ownership of 3,067 tons, significantly higher than Papua New Guinea's independent production of only 541 tons. Countries without Chinese investments have lower cobalt production levels, such as Australia and the Philippines, which produce around 7,070 tons and 5,270 tons, respectively. Other countries, including Canada, Cuba, and Russia, maintain relatively stable cobalt production without Chinese involvement. In total, the estimated global cobalt production by 2030 is expected to reach 300,692 tons, with China dominating ownership.

However, China's presence in the DRC not only increases employment opportunities but also poses significant health and environmental risks, especially due to excessive cobalt exploitation. The situation is exacerbated by the DRC government's weak enforcement of mining regulations, particularly in artisanal mining (Mann, 2017). The DRC has implemented several mining regulations, including the 2002 Mining Code, the 2003 Mining Regulation, and amendments to the Mining Code in 2018. Additionally, the DRC has formalized small-scale mining to curb rampant illegal mining. Other measures taken by the government include deploying military and police forces to combat illegal mining. In 2010, a Presidential Decree was issued to ban mining activities, but the regulation was revoked in March 2011. So far, the government's efforts to address mining issues have not been successful. The DRC government's decision to prohibit extractive activities has ironically forced miners to continue working illegally to sustain their livelihoods (Pein, 2022).

According to IPIS (2021), data mapping artisanal mining between 2009 and 2021, 2,629 mining sites were employing approximately 379,000 workers in the DRC. However, many of these miners lack the necessary permits or fail to comply with government regulations. The agency reported that around 200,000 people work illegally in mining operations. Even more concerning is that armed groups were identified as controlling mining activities in 1,013 of the 2,629 sites. Based on this data, the DRC government's efforts to combat illegal mining have so far been ineffective. The situation is

CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dbj Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

further aggravated by Chinese-owned mining operations that do not comply with Articles 81 and 204 of the Mining Law and Articles 357 and 358 of the Mining Law, which mandate mining permit holders and processing enterprises to be environmentally and socially responsible in their operational areas.

This responsibility includes obtaining an approved Environmental and Social Impact Assessment (ESIA), particularly with consent from local communities, and having an Environmental and Social Management Plan (ESMP). Field investigations have revealed that CDM lacks the required ESIA and ESMP to manage the negative environmental impacts of its activities. Given these issues, the urgency of addressing environmental and public health concerns in the DRC is becoming increasingly critical if the current situation persists. This paper aims to provide a realistic overview of the negative impacts of cobalt mining activities.

METHODS

This study employs a qualitative research methodology, which, according to Sugiyono, is a research approach where the researcher serves as the key instrument in examining a naturally occurring phenomenon (Sugiyono, 2020). The results of qualitative research are not intended for generalization but rather emphasize meaning. In qualitative methods, data collection is conducted through multiple techniques, and data analysis follows an inductive approach. Additionally, according to Bodgan and Biklen, as cited by Sugiyono (Sugiyono, 2020), qualitative descriptive research does not prioritize numerical data; instead, it presents findings in the form of sentences or images. The collected data is then analyzed by describing it in detail to ensure clarity for readers.

A qualitative research method is suitable for this study as it allows for a comprehensive analysis of the problematic health and environmental conditions in the DRC caused by Chinese cobalt companies. Data collection is conducted through a literature review, which includes gathering secondary data using library research techniques. This process involves collecting information from previous studies, journals, literature books, and relevant news sources, whether from libraries or online sources. Furthermore, data analysis is conducted descriptively to explain how events unfold by systematically organizing facts. The collected data is analyzed using the dependency theory framework.

The concept of human security is employed in this study to address the research objectives. The United Nations Development Program (UNDP, 1994) defines human security as the protection of individuals from threats affecting various aspects of life, including economic hardship, disease, hunger, environmental degradation, and other factors that may disrupt human activities and impact society at large. Furthermore, the Human Security Handbook cites the United Nations Trust Fund for Human Security (UNTFHS, 2016), which describes human security as ensuring individuals' rights to live freely and with dignity, free from poverty and despair.

The concept of human security gained attention after the Cold War, as the global community realized that security is not solely about states, military power, and warfare but also concerns human well-being (Persaud, 2022). In other words, human security represents a shift in security focus from state-centric concerns to individual well-being. The UNDP categorizes human security into seven components in its Human Development Report 1994, including economic security, environmental security, food security, health security, community security, personal security, and political security.

Sharbanou Tadjbakhsh offers a distinct perspective on human security, defining it through three key elements (Shahrbanou Tadjbakhsh, 2007). The first is freedom from fear, which refers to the protection of individuals from threats that endanger their physical or psychological well-being, including direct and indirect violence. The second is freedom from want, meaning that individuals

CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dof Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

should not experience deprivation and must have access to quality living conditions, necessities, and sustainable livelihoods. The third element, freedom from indignity, ensures that individuals are protected from discrimination and are granted the rights to make choices and seize opportunities without harming others.

This study focuses on two key components of human security as defined by the UNDP, which are health security and environmental security. Health security refers to the protection of individuals from health-related threats such as malnutrition, epidemics, poor sanitation, and limited access to basic healthcare services. Meanwhile, environmental security ensures that individuals live in a healthy environment, free from environmental degradation, natural disasters, air pollution, and resource depletion caused by human activities or natural factors.

RESULT AND DISCUSSION

China's Cobalt Mining. China and the Democratic Republic of the Congo (DRC) have a long history of cooperation. This history dates back to the period of King Leopold's rule, when China sent workers to the DRC to help build the national railway. Cooperation continued in the 1970s when Mobutu shifted to the Maoist regime, leading to collaboration on infrastructure projects. The partnership became even more evident in the 1990s, when Chinese individuals began taking key positions in the DRC. The Beijing government and various Chinese companies made massive investments, particularly in resource-rich countries with weak regulations, such as the DRC.

Peter Zhou, a Chinese investor involved in several mining deals in the DRC, stated that in countries with such conditions, corruption and a lack of rule of law provide greater freedom for entrepreneurship. In 2007, President Joseph Kabila signed a $6 billion infrastructure agreement with China, which included a provision allowing China to extract 600,000 tons of cobalt. This cobalt is crucial in supporting the green economy. However, behind the efforts to drive a green economy, there is a stark reality: the exploitation of both human and natural resources in the DRC.

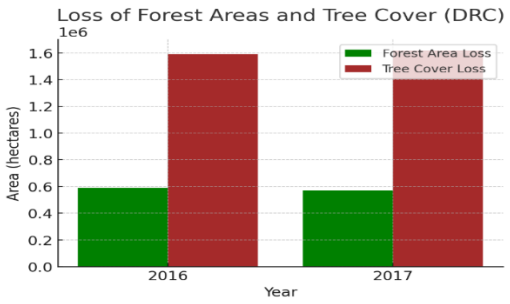
The Congolese government approved the deal with China based on China's promises to advance infrastructure development and provide large-scale investments. These infrastructure projects include public facilities such as roads, hospitals, schools, and mining sites. This agreement ultimately granted China access to explore the DRC's mineral resources (Iloydsbanktrade, 2022). China pledged to improve the DRC's infrastructure through its state-owned and private mining companies, which the government essentially funds as an extension of its strategic interests in securing control over the DRC (Uren, 2021). However, rather than facilitating mining infrastructure in the DRC, these transnational companies have instead hindered the country's development and stability (Nyabiage, 2021).

Several studies on Chinese companies indicate that they frequently fail to comply with environmental and human rights standards set by international agreements, the Constitution, and the Congolese Mining Law. These studies reveal that in addition to poor treatment of employees, Chinese companies have built mineral processing units near residential areas, posing serious health and safety risks to local communities. Similarly, the Business and Human Rights Resource Center has investigated the human rights and environmental records of Chinese companies operating overseas and found that Africa has the second-highest number of human rights and environmental violations linked to Chinese foreign investments, particularly in the metals and mining sector. Within this sector, inadequate disclosure of environmental impact assessments (EIA) has been identified as one of the primary risks—this issue was cited in 31% of 211 recorded allegations. Additionally, pollution and health impacts were identified as common concerns. The DRC ranks

CATRA RESEARCH INSTITUTE
• ISSN 2720 - 9644 (print)
• ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dol Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

fourth among African countries with the highest number of recorded violations committed by Chinese companies.

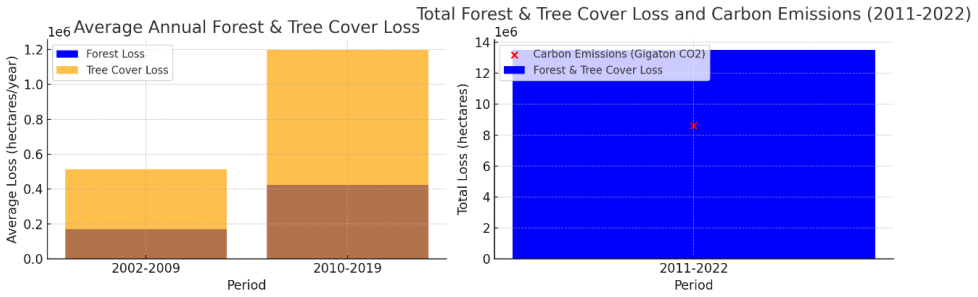
Environmental Impact. Data indicate that forest degradation in the Democratic Republic of the Congo (DRC) has significantly increased each year from 2011 to 2019 (Butler R. A., 2020). In 2016, the DRC lost approximately 590,000 hectares of forest area and 1,590,000 hectares of tree cover, while in 2017, forest loss reached 570,000 hectares, with 1,620,000 hectares of tree cover disappearing. This period recorded the highest deforestation rate in over a decade.



Note. (Butler, 2020)

Figure 2. Forest and Tree Cover Loss in DRC (2016-2017)

On average, between 2002 and 2009, the DRC lost 171,176 hectares of forest per year. However, this figure surged to 423,518 hectares per year from 2010 to 2019. Similarly, tree cover loss increased from 512,884 hectares to 1,197,498 hectares annually over the same period. According to Global Forest Watch, between 2011 and 2022, the DRC lost 13.5 million hectares of forest and tree cover, emitting an equivalent of 8.60 gigatons of carbon dioxide (Global Forest Watch, 2023). It indicates that mining activities, including cobalt extraction, have been a major contributor to deforestation and environmental degradation in the DRC.



Note. (Butler, 2020)

Figure 3. Total Forest & Tree Cover Loss and Carbon Emissions (2011-2022)

This environmental destruction not only results in forest loss but also triggers natural disasters such as floods, landslides, droughts, erosion, and biodiversity loss (Butler R. A., 2013). Additionally, climate change driven by deforestation has further worsened environmental conditions in the DRC. Mining activities also generate toxic waste that contaminates water, food crops, and air, posing significant health risks to surrounding communities (Muimba-Kankolongo, 2022). In the context of environmental sustainability and human security, most cobalt mining companies operating in the DRC have openly demonstrated their commitment to global business and human rights standards. Cobalt companies argue that the mineral they extract is clean, easily identifiable, and safe for long-

CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dbi Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

term use, making it a suitable alternative for low-carbon green energy. One Chinese company that has demonstrated this commitment is Zijin Mining.

Zijin Mining has shown its commitment to environmental safety by making maximum efforts to protect vegetation and minimize disruptions to ecosystems and green spaces. The company consistently advocates for green mining and emphasizes the implementation of effective water treatment systems. It has adopted a water balance model or closed-loop system to minimize water pollution. While the company claims that its cobalt mining operations are clean and sustainable, it also acknowledges the high environmental and human rights risks associated with cobalt mining activities. Zijin Mining recognizes the potential for water quality deterioration as a consequence of its operations.

At least 22 scientific studies and 20 civil society reports indicate that rivers, lakes, streams, groundwater, and wetlands near cobalt and copper mines in the DRC are heavily contaminated with toxic chemicals such as copper, cobalt, lead, arsenic, cadmium, uranium, manganese, mercury, and sulfuric acid. These pollutants not only damage ecosystems but also pose severe health threats to local communities, especially those living near mining sites. It underscores that while mining activities generate economic benefits, they also impose immense environmental and social costs on the DRC.

Health Impact. Due to mining activities, water pollution and natural resource depletion have increased, signaling environmental insecurity and posing health risks due to unsafe water sources. A study by Parfait Kaningu Bushenyula (2023) revealed that workers and residents living near cobalt mining areas in the DRC are highly vulnerable to various diseases, including diarrhea, malaria, and tuberculosis (TB). Annually, at least 41,814 deaths occur due to malaria, 41,301 deaths due to diarrhea, and 43,759 deaths due to TB (World Life Expectancy, 2020). Moreover, serious threats arise from psychosocial and biomechanical hazards, including stress and acute fatigue experienced by workers. A report by Daan Van Brusselen (2020) reinforced these findings, documenting cases of pregnancy complications and congenital disabilities resulting from exposure to toxic metals and chemicals from mining activities.

These health impacts are not only experienced directly by mining workers but also extend to surrounding communities, including women and children. Furthermore, health hazards associated with chemical exposure during mining operations have raised concerns. Nkuba conducted a case study at the Kamituga gold mine, where mercury use in gold processing has caused poisoning linked to neurological, kidney, and autoimmune disorders (Bossissi Nkuba, 2019). High-concentration mercury inhalation can even lead to respiratory failure and death. Mercury poisoning also affects motor and mental development, particularly in children.

These findings align with an Afterwatch report, which surveyed local communities and found that 56% of respondents expressed concern about their children's health, as they appeared more vulnerable to water pollution than adults, suffering from various illnesses at alarming rates. Consistently, community members reported that children experienced itching, rashes, eye irritation, coughing, and diarrhea, which they associated with exposure to contaminated water. Reproductive health issues have also emerged as a growing concern. Approximately 56% of respondents reported that women were facing increasing gynecological and reproductive health problems, including irregular menstrual cycles, urogenital infections, miscarriages, and congenital disabilities. Additionally, 72% of respondents reported recurring skin conditions such as itching, rashes, and white spots, resulting from contact with contaminated water. These findings confirm that mining activities not only threaten physical health but also have long-term implications for the quality of life of affected communities, particularly vulnerable groups such as women and children.

CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dof Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

CONCLUSION

China's involvement in the cobalt mining sector in the Democratic Republic of the Congo (DRC) reflects a complex and mutually beneficial relationship, yet it also exposes significant challenges for local communities and the environment. Since the early 1990s, massive investments from Chinese companies have reshaped the Congolese economy, particularly in the mining industry. Although cobalt is a crucial commodity for supporting the global green economy, on-the-ground realities show that resource extraction is often conducted without regard for environmental and human rights standards.

The environmental impact of cobalt mining is significant, with data showing a sharp increase in forest loss and a drastic decline in tree cover in the DRC. Between 2011 and 2022, the DRC lost approximately 13.5 million hectares of forest, contributing to high carbon emissions. Mining activities not only drive deforestation but also produce toxic waste that pollutes water sources and endangers public health. Research has shown that water pollution near mining sites contains hazardous chemicals that harm both ecosystems and the health of nearby populations.

From a health perspective, communities near cobalt mining areas face high risks of various diseases, including diarrhea, malaria, and reproductive health disorders. Exposure to toxic chemicals such as mercury has been linked to poisoning that affects neurological and physical health, particularly in children. These findings suggest that health impacts are not limited to mine workers but extend to wider communities, including vulnerable groups such as women and children.

Overall, while China's investment in the DRC's cobalt mining sector offers significant economic potential, the associated social and environmental impacts are substantial. Chinese companies' involvement often fails to meet expected international standards, posing serious challenges to environmental sustainability and public well-being. Therefore, the Congolese government, Chinese corporations, and the international community must collaborate in establishing stricter regulatory frameworks. It aims to ensure that mining practices are conducted responsibly, sustainably, and with respect for human rights. By doing so, the DRC's natural resources can be utilized for the benefit of its people without compromising the environment and public health.

REFERENCES

Benchmark Minerals. (2024, October). How much cobalt production is owned by Chinese companies? Retrieved from Benchmark Minerals: https://source.benchmarkminerals.com/article/how-much-cobalt-production-is-owned-by-chinese-companies

Bossissi Nkuba, L. B. (2019). Invisible and ignored? Local perspectives on mercury in Congolese gold mining. Journal of Cleaner Production, 795-804.

Butler, R. A. (2013). Deforestation Rate Falls in Congo Basin Countries. Retrieved from https://news.mongabay.com/2013/07/deforestation-rate-falls-in-congobasin-countries/

Butler, R. A. (2020). The Congo Rainforest. Retrieved from Mongabay: https://worldrainforests.com/congo/

Cobalt Institute. (2024). Cobalt Market Report 2023. Retrieved March 2025, from https://www.cobaltinstitute.org/resource/cobalt-market-report-2023/

ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dor Crossref ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics

Daan Van Brusselen, T. K.-K.-M. (2020). Metal mining and congenital disabilities: a case-control study in Lubumbashi, Democratic Republic of the Congo. *The Lancet Planetary Health, 4*(4).

Global Forest Watch. (2023). Democratic Republic of the Congo. Retrieved from https://www.globalforestwatch.org/dashboards/country/COD/?location=

Iloydsbanktrade. (2022). Foreign direct investment (FDI) in the Democratic Republic of Congo. Retrieved from Lloyds Bank trade: https://www.lloydsbanktrade.com/en/market-potential/democratic-republic-of-congo/investment#:~:text=According%20to%20UNCTAD's%202021%20World,by%20the%20Covid%2D19%20pandemic

IPIS. (2021). Artisanal Mining in DR Congo. Retrieved from IPIS Open Data dashboard: https://ipisresearch-dashboard.shinyapps.io/open_data_app/

Mann, E. (2017). Digital Technology is Dependent on Forced Labor: The Exploitative Labor Practices of Cobalt Extraction in the Democratic Republic of Congo. Retrieved from https://www.researchgate.net/publication/317684323_Effects_of_Cobalt_Chlorid

Muimba-Kankolongo, A. B. (2022). Impacts of Trace Metals Pollution of Water, Food Crops, and Ambient Air on Population Health in Zambia and the DR Congo. *Journal of environmental and public health*. Retrieved from https://doi.org/10.1155/2022/4515115

Nyabiage, J. (2021). Cobalt Blues: Congolese Miners, and Tiongkok's Role in Improving Their Conditions. Retrieved from https://www.drcminingweek.com/article/cobalt-blues-congolese-miners-and-Tiongkok-s-role-improving-their-condition

OPIS Staff. (2023). Cobalt, Congo and the Mining Conundrum. Retrieved March 2025, from https://www.opisnet.com/blog/cobalt-congo-and-the-mining-conundrum/

Parfait Kaningu Bushenyula, E. B. (2023). Participative epidemiology and prevention pathway of health risks associated with artisanal mines in the Luhihi area, DR Congo. BMC Public Health, 23.

Pein, R.-L. (2022). The 'formalization dilemma' of artisanal and small-scale mining: an analysis with reference to the Democratic Republic of the Congo. Retrieved from Faculty of Law, Department of Private Law: https://open.uct.ac.za/items/5ae53638-0ba5-475b-b3bd-8210340c210f

Persaud, R. B. (2022). Human security. Retrieved from Contemporary security studies: https://books.google.com/books?hl=en&lr=&id=yyRXEAAAQBAJ&oi=fnd&pg=PA144&dq=Persaud,+2013+human+security&ots=FD9elonnT-&sig=92qejAVpBcVpCjMzaiwN2FBaShc

Shahrbanou Tadjbakhsh, A. C. (2007). *Human Security Concepts and Implications.* London: Routledge.

Sugiyono. (2020). *Metode Penelitian Kuantitatif, Kualitatif dan R&D. In Sugiyono, Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.

UNDP. (1994). Human Development Report 1994. Retrieved from Oxford University Press: https://digitallibrary.un.org/record/240220

UNTFHS. (2016). Human Security Handbook. Retrieved from United Nations Online: https://www.un.org/humansecurity/wp-content/uploads/2017/10/h2.pdf

Uren, D. (2021). How Tiongkok wrested control of the Congo's critical minerals. Retrieved from https://www.aspistrategist.org.au/how-Tiongkok-wrested-control-of-the-congos-critical-minerals/

CATRA RESEARCH INSTITUTE
ISSN 2720 - 9644 (print)
ISSN 2721 - 0871 (online)
IJESSS
INTERNATIONAL JOURNAL OF ENVIRONMENTAL, SUSTAINABILITY AND SOCIAL SCIENCE
Indexed By : GARUDA Google dimensions ROAD INDEX COPERNICUS oneSearch ISJD sinta 4 EBSCO Clarivate Analytics WEB OF SCIENCE

Venditti, B. (2024). China's Cobalt Supply Dominance by 2030. Retrieved March 2025, from https://www.visualcapitalist.com/chinas-cobalt-supply-dominance-by-2030 /

World life expectancy. (2020). Retrieved 2025, from https://www.worldlifeexpectancy.com/