International Conference

Strategic minerals, mining and society in the D.R. Congo

PROGRAMME

Venue:
Palais des Académies
Rue Ducale 1, 1000 Brussels

CONTENT

1ST DAY – APRIL 2, 2025

13.00 – 13.30 Introductory talks (Philippe De Maeyer, Thierry De Putter, Arnaud Vajda)

13.30 – 14.00 **KEYNOTE LECTURE**
Nina Wilen (Egmont Institute)
Africa in the midst of the Current Global Power Competition

14.00 – 14.30 Q&A

14.30 – 15.00 *Coffee break & poster session*

ORAL COMMUNICATION
15.00 – 15.20 **Raw materials criticality assessment: A key tool to rethink EU-Africa Partnerships**
Gabriele Casella (Politecnico di Milano), Diana Shendrikova (Politecnico di Milano), Emanuela Colombo (Politecnico di Milano), Emidio Diodato (Università per Stranieri di Perugia), Silvia Orioli (Università per Stranieri di Perugia)

15.20 – 15.40 **Encadrement étatique de l'exploitation artisanale: le retour du monopole dans le secteur minier congolais?**
Ithiel Batumike Mihigo (UMons)

15.40 – 16.00 **The M23 conflict in DRC: A War for Strategic Minerals?**
Erik Kennes (Egmont Institute), Freddy Nzonga (Madini Project)

16.00 – 16.20 **Current trends of air quality in the Katangese copper belt: Data from preliminary monitoring**
Emery Kasongo Lenge Mukonzo (UNILU)

16.20 – 16.40 **Population exposure and vulnerability to mining-induced geo-hydrological hazards in the Eastern Democratic Republic of the Congo**
Christiane Migabo (UCLouvain), Marnik Vanclooster (UCLouvain), Sara Geenen (UAntwerpen), Caroline Michellier (UCLouvain, RMCA)

16.40 – 17.00 **Mining-induced environmental and social changes: How vulnerable is the population in the southeastern Democratic Republic of Congo?**
Serge Mugisho Mukotanyi (UAntwerpen, KMMA), Sara Geenen (UAntwerpen), Caroline Michellier (UCLouvain, RMCA), Bossissi Nkuba (UAntwerpen, RMCA)

2ND DAY – APRIL 3, 2025

08.45 – 09.00 Opening remarks

09.00 – 09.45 **KEYNOTE LECTURE**
Célestin Banza Lubaba Nkulu (UNILU) & Benoît Nemery (KULeuven)
Collateral damage to the environment and human health caused by mining strategic minerals in the D.R. Congo

09.45 – 10.00 Q&A

10.00 – 10.30 *Coffee break & poster session*

10.30 – 10.50 **Between hope and disappointment: Geology and exploration history of the Manono-Kitotolo lithium-tantalum-tin deposit**
Anouk Borst (KULeuven, RMCA)

10.50 – 11.10 **Cartographie des sites miniers et évaluation de la contamination par les éléments traces métalliques dans les eaux des rivières Ulindi et Elila, territoire de Mwenga, à l'Est de la République Démocratique du Congo**
Gabriel Mukabo Okito (UBurundi, ISP-Goma, UOBukavu), Sylvain Firiki Rumbaka (UOBukavu), Mulongaibalu Mbalassa (UOBukavu), Claver Sibomana (UBurundi), Gaspard Ntakimazi (UBurundi), Jean-Claude Micha (UNamur), Venant NSHOMBO MUDERHWA (UOBukavu, CRH-Uvira), Robert Mandiki (UNamur)

11.10 – 11.30 **Metal pollution and bioaccumulation in Lualaba aquatic ecosystems, DR Congo**
Paulin Kilufya Kalomo Kitikimo (UNILU), Paul Musa Obadia (UNILU), Trésor Carsi Kuhangana (UNIKOL), Taty Muta Musambo (UNILU), Irène Kabange Umba (UNILU?), Erick Smolders (KULeuven), Benoît Nemery (KULeuven), Célestin Banza Lubaba Nkulu (UNILU)

11.30 – 11.50 **Factors affecting local community feelings about water quality and availability around cobalt mines in Lualaba province, Democratic Republic of Congo**
Israel Muchiza Bachinyaga (UNILU)

11.50 – 12.10 **Biomonitoring of trace elements among artisanal gold miners in South-Kivu (D.R.Congo)**
Paterne Safari Mudekereza (UCBukavu), Roméo Bujiriri Murhega (UCBukavu), Franck Zahinda (UCBukavu), Patrick Katoto Cimusa (UCBukavu), Radu Corneliu Duca (Laboratoire National de Santé, Luxembourg), Matteo Creta (Laboratoire National de Santé, Luxembourg), Maria-Mirela Ani (Laboratoire National de Santé, Luxembourg), Frank Van Calenbergh (KULeuven), Philippe De Vloo (KULeuven), Benoît Nemery (KULeuven)

12.10 – 12.30 **Exposure assessment and respiratory health in cobalt artisanal miners in DR Congo**
Joseph Pyana Kitenge (KULeuven, UNILU), Paul Musa Obadia (UNILU), Trésor Carsi Kuhangana (UNIKOL); Celestin Banza Lubaba (UNILU), Jeroen Vanoirbeek (KULeuven), Steven Ronsmans (KULeuven), Benoît Nemery (KULeuven)

12.30 – 14.00 *Lunch break & poster session*

14.00 – 14.20 **Cobalt price fluctuations and socioeconomic conditions of small-scale artisanal miners in the Katanga Copper Arc in the Democratic Republic of Congo**
Eric Lubangu Muamba (UNILU)

14.20 – 14.40 **A socio-anthropological approach to uranium mining in the DRC**
Célia Carlier (UMons)

14.40 – 15.00 **Strategic (in)visibility: Corporate-funded multi-stakeholderism and cooperative partnerships in the cobalt mining in the Democratic Republic of Congo**
Sarah Katz-Lavigne (UAntwerpen), Sara Geenen (UAntwerpen), Hadassah Arian (UAntwerpen)

15.00 – 15.20 **Radon exposure and lack of oxygen in artisanal copper-cobalt underground mining in Kolwezi, DRC**
Paul Musa Obadia (UNILU), Joseph Pyana Kitenge (UNILU), Trésor Carsi Kuhangana (UNIKOL), Steven Verpaele (Belgian Centre for Occupational Hygiene), André Ndala Nyongonyi (UNILU), Tony Kayembe Kitenge (UNILU), Patrick de Marie Katoto

(UCBukavu), Desiré Nshimbi Mundali (UNILU), Elodie Lwendela Kalasa (UNILU), Boris Dehandschutter (Federal Agency for Nuclear Control), Célestin Banza Lubaba Nkulu (UNILU), Benoît Nemery (KULeuven)

15.20 – 15.40 **Biomonitoring of metals and respiratory health in a copper-cobalt refinery in Likasi**
Désiré Nshimbi Mundali (UNILU), Paul Musa Obadia (UNILU), Blandine Ngalula Mubadi (UNILU), Maria Mirela Ani (Laboratoire National de Santé, Luxembourg), Radu-Corneliu Duca (Laboratoire National de Santé, Luxembourg), Benoît Nemery (KULeuven)

15.40 – 16.00 **The cooperatives: Gatekeepers of the sites**
Espérant Mwishamali (UGent), Sara Geenen (UAntwerpen), Sarah Katz-Lavigne (UAntwerpen)

16.00 – 16.30 *Coffee break & poster session*

DOCUMENTARY MOVIES
16.30 – 17.15 Quentin Noirfalisse — "Cobalt, l'envers du rêve électrique"

17.15 – 18.00 Roy Maconachie, Simon Wharf & Bossissi Nkuba — "Cobalt Rush"

18.00 – 19.00 Q&A

19.00 – 19.45 *Cocktail*

3RD DAY – APRIL 4, 2025

08.45 – 09.00 Opening remarks

ORAL COMMUNICATION
09.00 – 09.20 **Future making: ASM formalization in the DRC's cobalt sector**
Hadassah Arian (UAntwerpen), Jeroen Cuvelier (UGent)

09.20 – 09.40 **Management of Kipushi mining environments: Involvement of local residents in phytostabilisation and cost evaluation in inhabited and uninhabited polluted areas**
Joëlle Kilela Mwamba (Terra Gembloux Agro-Bio-Tech ULiège, UNILU), Jacques Kilela Mwanasomwe (UNILU) Michel Mpundu Mubemba (UNILU), Gilles Colinet (Terra Gembloux Agro-Bio-Tech ULiège)

09.40 – 10.00 **Vernacular Knowledge and Local Resistance to Mining Extractivism in the DRC**
Rose Ukeci Uwodha (UMons)

10.00 – 10.30 *Coffee break & poster session*

10.30 – 12.30 Roundtable on mining and development (to be confirmed).

1. **Geology of the Isiro-Ngayu gold-bearing region, western belts of the Kibali granite-greenstone superterrane in the northeastern Congolese craton, Democratic Republic of Congo: Results of first field observations**
Didier Birimwiragi Namogo (ULiège, UGoma, UKisangani), Joseph Martial Akame (ULBruxelles), Mokili Mbuluyo (UUélé, UKisangani), Lavie Arsène Mango Itulamya (UGoma), Aurélia Hubert-Ferrari (ULiège

2. **Environmental hazards associated with mining activities in the tropics**
François Kervyn (MRAC), Anouk Borst (KULeuven, RMCA), Dominique Derauw (Centre Spatial Liège), Olivier Dewitte (RMCA), Sara Geenen (UAntwerpen), Murielle Kirkove (Centre Spatial Liège), Florias Mees (RMCA), Caroline Michellier (UCLouvain, RMCA), Serge Mugisho Mukotanyi (UAntwerpen), Christiane Nabintu Migabo (UCLouvain), Bossissi Nkuba (UAntwerpen, RMCA), Anne Orban (Centre Spatial Liège), Benoît Smets (RMCA, VUBrussel), Harald van der Werff (UTwente), Sachinthani Weeranayake (RMCA, UTwente)

3. **Dietary intake of cobalt and lead in the mining region of Katanga**
Trésor Carsi Kuhangana (UNIKOL, KULeuven), Germain Kasongo Tengwa (UMalembaNkulu), Lore Roels (KULeuven), Eddy Mbuyu Ilunga (UNILU), Taty Muta Musambo (UNILU), Paul Musa Obadia (UNILU, Centre Anti-Poison de Lubumbashi), Tony Kayembe Kitenge (UNILU, Institut Supérieur des Techniques Médicales de Lubumbashi), Patrick Katoto (UCBukavu, Stellenbosch University), Célestin Banza Lubaba Nkulu (UNILU), Erik Smolders (KULeuven), Peter Hoet (KULeuven), Benoît Nemery (KULeuven)

4. **Artisanal mining as a socioeconomic lifeline in Rubaya: Factors of dependence and sustainable alternatives**
Elie Idrissa (UGoma), Mafuko Nyandwi (UGoma)

5. **Domestic indoor radon exposure in Lubumbashi, DR Congo**
Élodie Lwendela Kalasa (UNILU), Gilbert Alpha Byadunia (UNILU), Desiré Nshimbi Mundali (UNILU), Trésor Carsi Kuhangana (UNIKOL), Joseph Pyana Kitenge (UNILU), Célestin Banza Lubaba Nkulu (UNILU), Boris Dehandschutter (Federal Agency for Nuclear Control), Benoît Nemery (KULeuven), Paul Musa Obadia (UNILU)

6. **Évaluation de l'impact des activités minières sur les ressources halieutiques et leur environnement dans le Grand Katanga en République Démocratique du Congo**
David Mfwana Inabanza (UNILU)

7. **Behavioral problems in children working in Kolwezi's artisanal copper-cobalt mines**
Paul Musa Obadia (UNILU), Eunice Bilonda Mbuyamba (UNILU), Joseph Pyana Kitenge (UNILU), Trésor Carsi Kuhangana (UNIKOL), Jean Paul Mande Ngoy (UNILU), Célestin Banza Lubaba Nkulu (UNILU), Laurence Ris (UMons), Daniel Okitundu (UNIKIN), Benoît Nemery (KULeuven)

8. **Erectile dysfunction in Copper-Cobalt miners: A cross-sectional study in Katanga, DRC**
Paul Musa Obadia (UNILU), Joseph Pyana Kitenge (UNILU), Trésor Carsi Kuhangana (UNIKOL), Georges Kalenga Ilunga (UNILU), Jaak Billen (Leuven University Hospitals), Tony Kayembe Kitenge (UNILU), Vincent Haufroid (UCLouvain), Abdon Mukalay Wa Mukalay (UNILU), Laurence Ris (UMons), Célestin Banza Lubaba Nkulu (UNILU), Benoît Nemery (KULeuven), Paul Enzlin (KULeuven)

9. **Hypoxaemia and risk of asphyxia during underground work in artisanal cobalt mines**
Paul Musa Obadia (UNILU), Joseph Pyana Kitenge (UNILU), Trésor Carsi Kuhangana (UNIKOL), Steven Verpaele (BeCOH), André Ndala Nyongonyi (UNILU), Tony Kayembe Kitenge (UNILU), Patrick de Marie Katoto (UCBukavu), Célestin Banza Lubaba Nkulu (UNILU), Benoît Nemery (KULeuven)

10. **Social environmental impacts of the exploitation of energy transition minerals in Lualaba and Haut Katanga in DRC: analysis of the practices of mining companies and state actors in the implementation of the law that govern the mining sector**
Espérant Mwishamali Lukobo (UGent, UCBukavu)

11. **The hidden legacy from the manufacture of asbestos-cement in DR Congo**
Joseph Pyana Kitenge (UNILU, KULeuven), Pascal Mambwe (KULeuven), Jan Van Bouwel (IBEVE), Paul Musa Obadia (UNILU), Désiré Mundali Nshimbi (UNILU), Tony Kayembe-Kitenge (UNILU), Jeroen Vanoirbeek (KULeuven), Célestin Banza Lubaba (UNILU), Steven Ronsmans (KULeuven), Benoît Nemery (KULeuven)

12. **Rapidly progressive silicosis masquerading as tuberculosis in cobalt mine workers**
Joseph Pyana Kitenge (UNILU, KULeuven, Centre Médical du Centre-Ville Lubumbashi), Qonitha Said-Hartley (U. of Cape Town), Adrianna Dubbeldam (KULeuven), Ida Kabeya Mulaji (UNIKOL), Pascal Kyansa Mangi (Centre Médical du Centre-Ville Lubumbashi), Paul Musa Obadia (UNILU), Mohamed Jeebhay (U. of Cape Town), Steven Ronsmans (KULeuven), Benoît Nemery (KULeuven)

ABSTRACT BOOK

1ST DAY

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APRIL 2, 2025

Raw Materials Criticality Assessment:
A Key Tool to Rethink EU-Africa Partnerships

Gabriele CASELLA[1,*], Diana SHENDRIKOVA[1], Emanuela COLOMBO[1],
Emidio DIODATO[2] & Silvia ORIOLI[2]

KEYWORDS. — Energy Policy; Evidence-based Policy Making; Critical Minerals; African Agency; African Great Lakes.

ABSTRACT. — The African Great Lakes region, particularly the Democratic Republic of Congo (DRC), plays a crucial role in the global energy transition, supplying 63 % of the world's cobalt and over 50 % of coltan [1], the primary source of tantalum, at the extraction stage. These minerals are respectively classified as strategic and critical in the recently published EU Critical Raw Materials (CRM) Act [2], with cobalt essential for cathode materials in various battery types, and tantalum widely used in capacitors for consumer electronics, automotive, and defence applications.

Given the fragmentation of African raw materials legislation and the shift in EU-Africa relations toward "post-normal times" [3] — characterized by greater African agency and the emergence of new partnerships — this study examines how criticality assessment methodologies shape EU-Africa relations and might contribute to a more sustainable and equitable industrialization within the raw materials sector.

By qualitatively and quantitatively comparing the three most important criticality assessment methodologies — the EU [2], US [4], and Chinese [5] — this study highlights the similarities and differences in the indicators used and their role in driving the energy transition while maintaining security. The findings show that an evidence-based CRMs assessment is an essential policy tool for shaping strategic commercial partnerships and prioritise specific areas of the raw materials value chain. Secondly, they emphasise the need to streamline a limited number of high-quality standards rather than creating new ones, to ensure proper enforcement. Lastly, they call for the establishment of a metals traceability mechanism — specifically for cobalt and coltan — to incentivise companies that prioritise transparency and responsible sourcing practices.

This study ultimately aims to provide insight into how the EU can promote a more sustainable and just industrialisation and effectively engage with Africa's efforts to limit the exportation of unprocessed minerals to retain value and strengthen domestic supply chains.

Table 1
Benchmarking of different criticality assessment methodologies

	INDICATORS				COMPARISON		
	Supply Risk	Economic Importance	Environmental Risk	Energy Importance	Number of indicators	Formulas/ Scoreboard	Number of CRMs
EU	☑	☑	☐	☐	2	F	34
USA	☑	☐	☐	☑	2	S	18
CHINA	☑	☑	☑	☐	3	F	18

REFERENCES

[1]   European Commission, «Study on the critical raw materials for the EU 2023: Final Report,» 2023. [Online]. Available: https://op.europa.eu/en/publication-detail/-/publication/57318397-fdd4-11ed-a05c-01aa75ed71a1.

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[2]   European Commission, «REGULATION (EU) 2024/1252 OF THE EUROPEAN PARLIA-MENT AND OF THE COUNCIL of 11 April 2024 establishing a framework for ensuring a se-cure and sustainable supply of critical raw materials and,» 2024. [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401252.

[3]   Sardar, Ziauddin. «Welcome to postnormal times.» Futures 42.5 (2010): 435-444.

[4]   US Department of Energy, «Critical Materials Assessment,» 2023. [Online]. Available: https://www.energy.gov/sites/default/files/2023-05/2023-critical-materials-assessment.pdf.

[5]   W. Yan, Z. Wang e H. Cao, «Criticality assessment of metal resources in China,» iScience, 2021.

Encadrement étatique de l'exploitation artisanale: le retour du monopole dans le secteur minier congolais?

Ithiel BATUMIKE MIHIGO[1,*]

MOTS-CLÉS. — Minerais; Traçabilité; Monopole; Artisanaux; Élites.

RÉSUMÉ. — Le Code minier de 2002 a libéralisé le secteur minier et y a supprimé le monopole jadis instauré en République démocratique du Congo (RDC). Ainsi, œuvrant seul ou en partenariat, l'État et ses entreprises devraient être traités sur un même pied que les investisseurs privés qui se donnent à cette même activité [1]. Pour accélérer l'effectivité de cette libéralisation, la Banque mondiale avait recommandé en 2008 la privatisation d'entreprises publiques telles que la Gécamines et la SOKIMO. Bien qu'ayant adhéré à cette recommandation, l'État congolais a torpillé toutes les réformes mises en place à cet effet à travers un désengagement de façade dans ses entreprises ou encore la substitution de celles-ci au cadastre minier en faisant survivre le régime conventionnel. Poursuivant dans cet élan, la RDC a déclaré stratégiques certains minerais [2]. Mais la descente aux enfers de ses propres entreprises ne lui permet plus de contrôler la production de ces minerais désormais l'apanage des multinationales mieux outillées pour ce faire. La formalisation du secteur minier industriel est un gage pour la stabilité des investissements étrangers en présence. Pour retrouver une place dans cette production, l'État avance vers le retour du monopole s'agissant des produits de l'exploitation minière artisanale de ces minerais. L'entreprise générale du Cobalt (EGC) et DRC Gold Trading SA anciennement Primera Gold RDC, une jointe venture entre la RDC et Primera Group et Primera Mining, une entreprise des Émirats Arabes Unis, sont les deux initiatives de cette stratégie monopolistique de l'État congolais. La première rassemble le cobalt, la seconde assemble l'or produit artisanalement sur l'ensemble du territoire national.

Officiellement ces initiatives visent notamment à assurer au pays une souveraineté économique en recueillant exclusivement toute la production des artisanaux miniers et sa traçabilité permettant ainsi de lutter contre le travail des enfants dans les mines et d'empêcher qu'elle n'alimente les conflits armés dans l'Est. Dans la pratique, cependant, ces initiatives constituent des brèches pour les élites politiques d'influer sur les activités minières en contournant la réglementation en vigueur. Le secteur minier artisanal étant plus caractérisé par l'informalité, les élites politiques ont la facilité de capturer des revenus et d'y protéger leurs intérêts loin des regards des ONG locales et internationales.

Nous postulons que le caractère stratégique de ces minerais pour la Nation explique le recul de réformes libérales adoptées depuis 2002 en RDC. Il replace l'État et ses acteurs pertinents au cœur de l'activité minière. Ainsi, il devient difficile que ces initiatives améliorent les conditions des exploitants artisanaux qui désormais n'ont qu'un seul choix de vendre à l'État leurs produits sans chercher le mieux offrant. D'ailleurs, la tentative de contournement de ces dispositifs peut être considérée comme une collision avec les rebelles et les ennemis du pays. En 2023, quelques opérateurs économiques avaient été arrêtés à Bukavu et transférés à Kinshasa où ils y avaient été jugés pour financement du terrorisme dans le cadre d'un commerce qu'il exerçait en marge de Primera. Ce monopole devient de ce fait en plus d'une atteinte au droit à la propriété privée, une menace à la liberté des personnes impliquées dans l'exploitation artisanale des mines en RDC.

Pour démontrer cet argument, nous mobilisons les approches de gouvernance réelle et political settlements en confrontant les textes juridiques récents à la pratique des structures créées pour encadrer la production locale.

NOTES

[1]   Exposé des motifs de la loi de 2002 portant code minier.
[2]   Décret n°18/042 du 24 novembre 2018.

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The M23 conflict in DRC:
A War for Strategic Minerals?

Erik KENNES[1,*] & Freddy NZONGA[2]

KEYWORDS. — DRCongo; Rwanda; Strategic Minerals; Mining Sector; Conflict Studies.

ABSTRACT. — According to a theory widespread in the DRCongo, Rwanda is a puppet of western mining companies who use President Kagame to foster the carving up of the DRC in order to get access to critical minerals. This is currently the commonly accepted explanation for the ongoing war in East-Congo. This interpretation is a matter of conjecture rather than of available evidence. The paper is an effort to analyze the available evidence (from a very secretive country) and see which conclusions can be drawn with respect to the mentioned conspiracy theory.

The focus of the paper is on the gold and coltan supply chain and tries to address the following topics:

1. Coltan and the DRC conflict

   – Structure of the international coltan supply chain
   – Coltan production DRC and Rwanda 1996-2025
   – Regulation efforts: ICGLR certification, ITSCI, RMI, DRC systems
   – Coltan in Rwanda: sources of revenue
   – Consequences of the war since 2021
   – The players: producing and processing companies
   – European Union CRM policy

2. Gold and the DRC conflict

   – Historical overview
   – Gold supply chain DRC/Rwanda
   – Regulation efforts: ICGLR certification, DRC systems
   – Attempt to control: Primera Gold and Congo Gold raffinerie
   – Source of revenue for Rwanda and Uganda

3. 2021-2024: a war for minerals?

   – Rwandan Great Lakes policy
   – Overview and motivation for the ongoing conflict in East-Congo
   – Simplistic narratives and tactical consequences

4. Concusion

The paper is based on (1) available official data and publications (2) interviews in DRC (3) key informants (4) years of field experience of both authors.

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Current trends of air quality in the Katangese copper belt: Data from preliminary monitoring

Emery Kasongo Lenge Mukonzo[1,*]

ABSTRACT. — The Katangese Copper Arc (ACK) has been the subject of several environmental studies, with a strong emphasis on biodiversity issues, trace metal element levels in soils, water and plant biomass, as well as public health aspects. Issues relating to air composition have not been addressed so far. Hourly data on air composition in aerosols ($PM_{2.5}$ and PM_{10}), some gases (CO_2, CO, CH_2O, NO_2, SO_2 and O_3), humidity, noise, as well as wind speed and direction were recorded using sensors installed in two mining sites: Lupoto (around Lubumbashi, in the centre of the ACK) and Kisanfu (in the West, around Kolwezi) for the year 2024. A very strong demarcation in terms of air composition was displayed between these two sites. For example, the average annual CO_2 content in the air increased from 280.5 +/- 24.1µg/m^3 in Lupoto at 456.6 +/- 9.01µg/m^3 at Kisanfu. Such differences are also observed for several other variables. This situation would be linked to the extent of land occupation by mining activities between the two sites, the levels of CO_2 emissions related to it and the capacity of the levels of vegetation cover to consume this gas by photosynthesis. In-depth studies are relevant to better understand the problem and to identify strategies for managing the mining environment that can restore air quality. The «Klimatron» project, partially funded by the King Baudouin Foundation, plans to further this direction.

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Population exposure and vulnerability to mining-Induced geo-hydrological hazards in the Eastern Democratic Republic of the Congo

Christiane MIGABO[1,2,*], Marnik VANCLOOSTER[1], Sara GEENEN[3]
& Caroline MICHELLIER[1,4]

KEYWORDS. — Environment; Satellite Data; Survey; South Kivu; Community Vulnerability.

ABSTRACT. — Mining activities in Eastern Democratic Republic of the Congo (DRC) have significantly reshaped the region's socio-environmental systems, causing land cover and land use changes that disrupt ecosystems, heighten geo-hydrological hazards, and endanger local livelihoods. The region's mountainous terrain, coupled with socio-economic vulnerability, further amplifies risks, leaving populations highly exposed to mining-induced environmental changes. This research, as part of the EDITOR project, aims to evaluate the spatiotemporal dynamics of population exposure and social vulnerability to mining-related geo-hydrological hazards and resource degradation.

Key objectives include evaluating the extent and drivers of land cover and land use changes using remote sensing and geographic information systems. It will further explore the impact of these changes on geo-hydrological hazards such as landslides and flooding, as well as the degradation of essential resources like water, forests, and agricultural land. The study will identify areas with high population exposure to such hazards and analyze socio-economic factors that exacerbate community vulnerability while examining local coping strategies.

Using a mixed-methods approach, which combines remote sensing, geographic information systems, field surveys, and socio-economic analyses. The study will map the extent and drivers of mining-induced land use changes, assess their environmental impacts, and analyze social vulnerability factors such as demographic patterns, economic conditions, and community resilience. A vulnerability index, tailored to the South Kivu context, will be developed to identify high-risk communities and understand how socio-environmental factors shape vulnerability. Expected outcomes include a comprehensive understanding of the interplay between mining activities, land degradation, and community vulnerability. Recommendations for sustainable land management, hazard mitigation, and responsible mining practices will be provided to guide policy interventions and enhance resilience.

This study contributes to bridging knowledge gaps about mining's socio-environmental consequences in Eastern DRC, offering actionable insights to promote sustainable practices and protect vulnerable populations. The poster will be a presentation of the study research design.

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Mining-induced environmental and social changes: How vulnerable is the population in the Southeastern Democratic Republic of Congo

Serge Mugisho Mukotanyi[1,2,*], Sara Geenen[1], Caroline Michellier[2,3] & Bossissi Nkuba[2,3]

KEYWORDS. — Political Ecology; Vulnerability Assessments; Lualaba Province.

ABSTRACT. — This PhD research, situated within the BELSPO EDITOR project, aims to investigate the vulnerability of populations to environmental changes induced by mining activities in Lualaba province. Rural communities in this region heavily depend on forests, land, and water for their livelihoods through activities such as forestry, subsistence agriculture and fishing. The degradation of these vital resources due to mining not only threatens their sustainable livelihoods but also exacerbates their vulnerability to environmental changes. However, the various components of vulnerability (physical, social, economic, and environmental) are not yet sufficiently understood at the local level, creating gaps in knowledge about how landscape changes and resource degradation accumulate over time and space. The study will address three key research questions: Which critical ecosystems are affected by mining, and how do these disruptions impact the services local populations rely on? Additionally, it will explore how mining-induced environmental changes influence community dependence on natural resources and extend to communities situated further from mining sites. By incorporating insights from political ecology, the research will analyze the power dynamics and decision-making processes that contribute to environmental degradation and its socio-economic consequences. Expected outcomes include a comprehensive understanding of the interplay between mining activities and ecosystem services, insights into the resilience and adaptive capacities of populations, and the identification of strategies for effective resource management that prioritize community well-being. This research will also contribute to the broader discourse on environmental change, climate action, and sustainable development in the DRC, linking to the Sustainable Development Goals. Ultimately, it aims to provide empirical case studies and methodological advancements that enhance vulnerability assessments and inform policies that mitigate the adverse effects of mining, ensuring that local communities can sustain their livelihoods and cultural identities amidst ongoing environmental challenges. The poster will present the research design as well as the results of a first exploratory field research.

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2ND DAY

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APRIL 3, 2025

Between hope and disappointment: Geology and exploration history of the Manono-Kitotolo lithium-tantalum-tin deposit

Anouk Borst[1,2,*]

KEYWORDS. — Geology; Mineral Resources; Lithium; Historic Mining; Geopolitics.

ABSTRACT. — The eastern provinces of the DRC host world-class deposits of tin (cassiterite), tantalum (columbite-tantalite) and tungsten (wolframite/ferberite), collectively known as the 3Ts. These minerals, along with gold, have fueled conflict and geopolitical tensions in the region. The mineralization is associated with granitic magmatism in geological terrains known as the Karagwe-Ankole and Kibara belts, which span across Rwanda, Northern Burundi, and eastern DRC. The mineralization is hosted in magmatic rocks known as pegmatites, hydrothermal quartz veins, and their chemical and sedimentary weathering products. While the softened weathered surface deposits are amenable for artisanal mining, lithium enrichment at depth has created renewed interest in industrial exploitation.

This study focuses on the Manono-Kitotolo project in Tanganyika Province, home to the world's largest known lithium-tantalum-tin pegmatite (~300 m thick, 13.5 km long). Cassiterite was industrially mined from 1915 to 1985, until declining tin prices and political instability halted operations (Dewaele *et al.*, 2016). Since then, artisanal mining of cassiterite and columbite-tantalite has persisted, with thousands of miners working the site daily (fig. 1). Exploration activities restarted in 2017, when AVZ Minerals acquired a concession through its joint venture Dathcom Mining with DRC based Cominière. Recent drilling campaigns defined a resource of 842 Mt at 1.61 % Li_2O, 709 ppm Sn, and 37 ppm Ta (AVZ, 2024), with high-grade zones exceeding 2 % Li_2O, making it largest hard-rock lithium deposit in the world.

Despite local anticipation of economic revitalization, Dathcom's project has stalled due to ownership disputes between AVZ Minerals, its joint venture partner Cominière, and Chinese owned Zijin Mining. Despite ongoing arbitration proceedings, Zijin has announced plans to start lithium production in 2026 (Clowes, 2025). This case underscores the broader challenges of resource governance in the DRC, amid rising global competition for strategic minerals.

Fig. 1. — Artisanal miners concentrating cassiterite in the Likushi river, Manono (Aug 2022).

REFERENCES

Dewaele, S., Hulsbosch, N., Cryns, Y., Boyce, A., Burgess, R. & Muchez, P. (2016). Geological setting and timing of the world-class Sn, Nb–Ta and Li mineralization of Manono-Kitotolo (Katanga, Democratic Republic of Congo). Ore Geology Reviews, 72(P1), 373-390 [https://doi.org/10.1016/J.OREGEOREV.2015.07.004].

AVZ ASX Announcement. (2024). Manono Project Mineral Resource increases 47 % to 842 Mt as Roche Dure tonnages expanded. www.avzminerals.com.au, pp. 1-29.

Clowes, W. (2025). Zijin plans lithium production in Congo from 2026, Bloomberg News [https://www.mining.com/web/zijin-expects-drc-lithium-project-to-start-productionin-first-quarter-of-2026/]

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Cartographie des sites miniers et évaluation de la contamination par les éléments traces métalliques dans les eaux des rivières Ulindi et Elila, territoire de Mwenga, à l'Est de la République Démocratique du Congo

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MOTS-CLÉS. — Pollution métallique; Cartographie minière; Éléments traces métalliques; Rivières Ulindi et Elila; Exploitation minière artisanale; RDC.

RÉSUMÉ. — L'exploitation minière artisanale et semi-industrielle constitue une source majeure de contamination par les éléments traces métalliques (ETM) dans les écosystèmes aquatiques de la République Démocratique du Congo (RDC). Les rivières Ulindi et Elila, essentielles pour les communautés locales, sont particulièrement touchées par ces pollutions qui menacent la biodiversité et la santé publique.

Cette étude vise à cartographier les sites miniers dans le territoire de Mwenga et à évaluer la contamination des eaux des rivières Ulindi et Elila par les ETM, afin de fournir des données critiques pour une gestion durable des ressources.

Une cartographie précise des sites miniers a été réalisée à l'aide de données géospatiales et d'analyses sur le terrain. Dix sites d'échantillonnage ont été sélectionnés, où les concentrations d'ETM (Hg, Cd, Pb, et autres) ont été mesurées dans l'eau, les sédiments et les poissons, à l'aide de la spectrométrie d'absorption atomique. Les résultats ont été comparés aux normes internationales de qualité de l'eau.

- Cartographie: 118 sites miniers ont été identifiés, avec une forte concentration dans la collectivité de Wamuzimu.
- Contamination: Des concentrations alarmantes de Hg (jusqu'à 0,73 mg/L) et de Pb (41,45 mg/L) dépassent largement les normes de l'OMS. Les niveaux élevés de Cd, As, et d'autres métaux ont également été relevés.
- Impacts environnementaux: Une dégradation significative des écosystèmes aquatiques a été constatée, menaçant la biodiversité et augmentant les risques pour la santé humaine.

L'étude met en évidence l'urgence d'une régulation stricte des activités minières et d'une surveillance continue de la qualité des eaux. Elle recommande des approches de restauration environnementale, l'adoption de techniques d'extraction plus propres, et une collaboration renforcée entre les parties prenantes locales et internationales pour une gestion durable des ressources minières et aquatiques.

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Metal Pollution and Bioaccumulation in Lualaba Aquatic Ecosystems, DR Congo

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KEYWORDS. — Environmental Monitoring; Risk Assessment; Toxic Metals; Fungurume; Kolwezi; Water Quality.

ABSTRACT. —

Background: Mining activities may contribute to metal pollution of aquatic ecosystems. This study assessed metal concentrations in surface water, sediments, and fish collected from selected locations in Kolwezi and Fungurume.

Methods: Samples of water, sediment, and fish were collected between January and March 2024 from four water bodies in Kolwezi (60) and two in Fungurume (30). pH and metal concentrations (ICP-MS) were measured and bioconcentration factors (BCF) were calculated as metal concentration in fish/metal concentration in water (Cfish/Cwater) to assess the extent of metal accumulation in fish.

Results: Water samples from Kolwezi (n=60) had higher metal concentrations than those from Fungurume (n=30), with median [interquartile range] concentrations (µg/L) as follows: Mn: 122 [19.6–3801] vs 53 [6.49–428], p = 0.04; Cd: 0.09 [0.01–0.59] vs 0.02 [0.01–0.03], p = 0.01; and Co: 0.55 [0.28–1.81] vs 0.17 [0.10–0.37], p < 0.001. Median pH was 6.72 (6.22–7.26) in Kolwezi and 6.54 (6.32–7.18) in Fungurume. In contrast, sediment samples from Fungurume (n=22) had significantly higher metal concentrations (µg/Kg) for Mn, Ni, and W compared to Kolwezi (n=24). Spearman correlations between water and sediment concentrations were positive for Cu (r = 0.5, p = 0.002) and Co (r = 0.3, p = 0.05). Substantial metal accumulation was found in fish, with median BCF values as follows: Cd: 1654, As: 1000, Co: 387, and U: 90 for Lualaba stream (n=5) and Cd: 2966, As: 458, Co: 1753, and U: 8.39 for Nzilo lake (n=6).

Conclusion: We found substantial metal contamination in surface water and sediments, with distinct spatial variation and evidence of bioaccumulation in fish. These findings highlight the need for continuous environmental monitoring and targeted mitigation strategies to reduce metal pollution and potential health impacts.

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Factors affecting local community feelings about water quality and availability around cobalt mines in Lualaba province, Democratic Republic of Congo

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KEYWORDS. — Perception; Feelings; Local Community; Water Pollution; Extractives Activities.

ABSTRACT. — Mining plays a crucial role in the progress of humanity and the world economy in general. Among the minerals mined, cobalt plays an indispensable role in the global energy transition, particularly as it contributes to the manufacture of electric batteries. However, cobalt is under severe pressure from the outset, with limited stocks and uneven distribution across the globe. In Africa, the Democratic Republic of Congo (DRC) alone contains more than half of the country's cobalt reserves, which could contribute 20 % of the national economy's GDP. Unfortunately, the standard of living of the population around mining activities leaves much to be desired in some parts of the country. A case in point is the province of Lualaba in the south-east of the country, where the population is heavily dependent on mining activities but unfortunately remains in conditions of extreme poverty. In addition, mining in this region leads to social conflicts over the use of water between the local communities and the miners. Other problems, particularly environmental and health issues surrounding mining activities, have a negative impact on the quality of life of the population living near the mines. Among the environmental challenges, on the one hand, the literature reports water pollution by mining effluents and, on the other hand, from a health point of view, the presence of heavy metals in the urine of communities living in areas close to mining activities. In the light of these problems, it is important to identify the factors underlying local feelings about water quality and availability, and to propose mechanisms for sustainable water management in the Lualaba region.

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Biomonitoring of trace elements among artisanal gold miners in South-Kivu (D.R.Congo)

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KEYWORDS. — Gold Artisanal Mining; Occupational Exposure; Trace Elements; Congenital defects; DR Congo.

ABSTRACT. —

Background: In the context of a study into the possible relation between birth defects and mining, we assessed exposure to trace metals in Kamituga, a city with numerous artisanal gold mines.

Methods: Trace metals were measured by ICP-MS in blood and urine obtained in November 2021 from men and women recruited, by convenience sampling, at work or at home close to the mine.

Results: Samples were obtained from 30 men and 21 women [mean age 43.6 y (range 21-71y), 41 miners, 10 non-miners)]. Male mineworkers were mainly involved in underground extraction or mechanical ore crushing; female mineworkers were mainly involved in manual ore crushing. Amalgamation with mercury was not done on the surveyed site. No excessive concentrations of trace metals (medians with IQR) were found in blood (µg/L), except for thallium (0.066; 0.053–0.084) and lead (450; 299–536). Urinary concentrations (µg/g creatinine) were elevated for nickel (6.27; 4.58–9.23), arsenic (45.9; 24.6–62.5), thallium (0.61; 0.41–1.00), and lead (14.2; 8.3–30.1), also when compared with 21 adult controls from Bukavu, especially for arsenic (4.77; 3.26–7.20) and lead (0.88; 0.54–2.38). No significant differences were observed between men and women, or between participants recruited at work and at home.

Conclusion: In this preliminary cross-sectional survey in and around an artisanal gold mine, the most significant observation concerns the high blood and urinary levels of lead, in association with some other toxic elements. The exact cause remains to be clarified.

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Exposure Assessment and Respiratory Health in Cobalt Artisanal Miners in DR Congo

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KEYWORDS. — Occupational Health; Mining; DR Congo.

ABSTRACT. — A considerable proportion of the copper and cobalt mined in the former Katanga province is extracted from artisanal mines with little regard for occupational safety and health. We assessed exposure and investigated respiratory health in artisanal miners.

Methodology: In a cross-sectional study (March to May 2021), we included, by convenience sampling, 111 male artisanal miners (37 from one surface mine and 74 from two underground mines) in Kolwezi, and 97 collective taxi-drivers from Lubumbashi. Participants replied to a validated questionnaire (ECRHS III), administered face-to-face, and performed spirometry at the workplace. Limited personal dust sampling was done, and biomonitoring of trace metals was performed in blood (miners only) and urine.

Results: Participants did not differ by age in surface (32.1±8.2y) and underground miners (34.9±7.8y), as compared to taxi-drivers (35.9±9.8y), BMI (23.1±2.6 and 23.4±2.6 vs 22.8±3.5), current smoking status (54 % and 64 % vs 52 %). A history of TB (11/111 vs 1/31) was more prevalent among miners than taxi-drivers. Respiratory symptoms (including nasal obstruction, epistaxis, breathlessness and chest tightness) were more prevalent among underground than surface miners. The groups did not differ significantly regarding spirometric parameters (except for PEF) or baseline SpO_2. Inhalable dust concentration was 6 times higher (32.8 mg/m3) in an underground mine than in the surface mine. Biomonitoring of trace metals revealed high mean blood concentrations of cobalt (µg/L) among surface (3.43) and underground miners (6.07), as compared to values observed in local (and other) non-mining populations. Mean urinary cobalt concentrations (µg/gr creatinine) were similar among surface (30.0) and underground miners (30.5) but much higher than among controls (2.53).

Conclusion: We documented high dust exposure to dust and trace metals in artisanal cobalt miners. In spite of a high prevalence of respiratory symptoms, spirometry was not yet affected in these young working men. Further investigations are needed to document dust exposure and mining-related diseases in this category of workers. Importantly, risk management and policies should be implemented to protect mineworkers' health.

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Cobalt Price Fluctuations and Socioeconomic Conditions of Small-Scale Artisanal Miners in the Katanga Copper Arc in the Democratic Republic of Congo

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KEYWORDS. — Fluctuation; Volatility; ASM; ACK.

ABSTRACT. — Cobalt is one of the metals that defines the modern world (Robertson, 2019). It is at the heart of global economic issues, due to its growing demand for advanced technologies, such as batteries for electric vehicles and electronic devices. The Katanga Copper Arc in southern DRC holds a significant share of the world's cobalt reserves, making the region a major player in global supply. However, fluctuations in cobalt prices and the working conditions of small-scale artisanal miners in this region pose considerable socio-economic challenges. While industrial miners, often foreign, adjust their investments according to prices, which impacts long-term projects, these fluctuations can have devastating effects on small-scale artisanal miners, who find themselves without a stable source of income. Mining areas then experience a deterioration in living conditions.

In proposing this paper, our objective is twofold: to understand in depth the effects of cobalt price fluctuations on local workers and to identify the factors underlying these dynamics. An integrated approach, involving local authorities, companies, NGOs and communities, is necessary to ensure a more equitable and sustainable exploitation of cobalt, while improving the living conditions of small-scale artisanal miners and reducing the associated socio-economic risks. Our methodological approach will be rigorous and multi-faceted to better understand the interconnection between cobalt price fluctuations and the socio-economic conditions of small-scale artisanal miners in the ACK. It will include several qualitative and quantitative approaches, an analysis of economic data, as well as field studies.

REFERENCE

Robertson, J. (2019, Août 12). Le prix de l'or bleu est en chute libre malgré le secteur de l'électrique en plein boom. BBC News.

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A socio-anthropological approach to uranium mining in the DRC

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KEYWORDS. — Socio-anthropology; Interviews; Observation; Democratic Republic of Congo; Uranium.

ABSTRACT. — Since the beginning of the 20th century, interest in uranium ore has continued to grow. Medicine, weapons, energy... There are numerous sectors where this ore is needed. In the Democratic Republic of Congo, uranium is at the heart of major international issues, while at the same time constituting a major taboo. The literature on the extraction of this ore focuses mainly on social, environmental/sanitary, economic, geopolitical, security and historical issues. However, this literature does not propose a socio-anthropological approach to fully understand the dynamics of this extraction, particularly in the (post)colonial context of the DRC. Thus, its modern, 'linear' approach is not enough to fully understand what is politically and socially at stake in the (post)colonial extraction of this ore and, more broadly, in the Anthropocene. Based until now on interviews and observations conducted in the Shinkolobwe area, in Lubumbashi and Likasi, this research shows the need to consider a wider range of actors – in particular non-human actors (visible and invisible) – and to overcome the modern narrative that can be made of this extraction. It therefore aims to answer the following research question: how can a socio-anthropological approach to uranium mining in the DRC reveal the political, social and metaphysical (human/non-human) dynamics made invisible by modern narratives of extractivism, in a postcolonial and Anthropocene context? Specifically, it aims to (i) explore what it means to live amid this uranium; (ii) study the networks that are formed around it (multisite ethnography); and (iii) the 'traces' that remain of this extraction. This research is thus helping to enrich the field of research into uranium mining, particularly in the DRC, by offering a new socio-anthropological perspective on mining dynamics.

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Strategic (in)visibility:
Corporate-funded multi-stakeholderism and cooperative partnerships in the cobalt mining in the Democratic Republic of Congo

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KEYWORDS. — Cobalt Supply Chains; Multistakeholder Initiatives; Partnerships; Governance; Invisibility.

ABSTRACT. — While visible "development" interventions, often in the form of NGO and UN billboards that proudly proclaim a project or program, are a common sight in the DRC, some international initiatives with the goal of "cleaning up" mines where cobalt is mined artisanally are surprisingly muted when it comes to advertising. What accounts for such a seemingly counterintuitive scenario? Actors in the "responsible sourcing" space, like Cobalt for Development and the Fair Cobalt Alliance, prefer to partner with local actors (such as mining cooperatives) for reasons of local empowerment and long-term sustainability, but we contend that this is not the whole story. Drawing on work on (in)visibility, including Thung (2023) on "regimes of visibility," we contend that high-profile corporate backers, such as mining companies and car producers, strategically (in)visibilize themselves in the cobalt-mining sector in the DRC in order to forestall and address perceived "risks" in the sector. At the same time, they maintain a veil of secrecy over their own involvement in more "controversial" segments of mineral supply chains, and influence developments at (somewhat of) a distance through NGO and cooperative intermediaries.

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Radon Exposure in Artisanal Copper-Cobalt Underground Mining in Kolwezi, DRC

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KEYWORDS. — Occupational Health; Radiation Risk; Lung Cancer; Environmental Hazard.
ABSTRACT. —

Background/purpose: Cobalt mining plays a crucial role for the local and national economy, but leads to serious occupational health risks, including exposure to radon, a radioactive gas resulting from the decay of uranium, which is abundant in the mined ore. Inhalation of radon is a well-established risk of lung cancer. We assessed, for the first time, average radon concentrations in artisanal copper-cobalt underground mines in Kolwezi.

Methods: Alpha-track detectors (Radtrak3, Radonova, Sweden) were placed between August 2022 and April 2023 at various underground locations of three artisanal copper-cobalt mines (Kamilombe, Bridon, and UCK), where they remained underground for about two months.

Results: Out of 30 deployed detectors, 20 could be retrieved after 60 to 84 days (most losses being due to cave-ins). Median (range) radon concentrations were 1425 Bq/m³ (111–6848 Bq/m³) in the Kamilombe mine (n=10), 2210 Bq/m³ (range: 330–13840 Bq/m³) in Bridon mine (n= 5), and exceeded saturation concentrations of about 24800 Bq/m³ (12500–28912 Bq/m³) in UCK mine (n=5). These levels are far above the limit of 300 Bq/m³ recommended by the International Commission on Radiological Protection (ICPR) for occupational settings.

Conclusions: Radon concentrations recorded in underground mines included in this study are alarming, with some levels exceeding nearly 100 times the occupational safety limit. The lack of proper ventilation in these underground shafts exacerbates the accumulation of radon, leading to significant long-term health risks to miners, mainly lung cancer. Immediate intervention measures are critical to protect the workers' health.

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Biomonitoring of metals and respiratory health in a copper-cobalt refinery in Likasi

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KEYWORDS. — Occupational Exposure; Metal Fumes; Spirometry; Lung Function.

ABSTRACT. —

Background: Occupational exposure to metal dust and fumes in copper-cobalt refining may affect respiratory health.

Aims: This study investigated respiratory symptoms, lung function, and metal exposure among workers from seven different workstations shifts in the Shituru refinery in Likasi, DR Congo.

Methods: In a cross-sectional study, workers were recruited directly from their work sites. Data collection included the European Community Respiratory Health Survey (ECRHS) questionnaire, spirometry, and biomonitoring of metals in blood and urine. Metal concentrations were measured by ICP-MS and urinary metal concentrations were adjusted for creatinine.

Results: The study included 218 workers (98 % males, 2 % females) with median [interquartile range] age of 47y [39–61] and work seniority of 15 y [7–30].Blood and urine concentrations of several trace elements were high compared to published reference values and values obtained locally in non-occupationally exposed populations, and significant differences were observed between workers from different work stations for chromium (Cr), cobalt (Co), arsenic (As), selenium (Se), cadmium (Cd), mercury (Hg), and lead (Pb). Workers of the lixiviation station reported higher prevalence of dyspnea during work compared to other shifts. However, spirometric indices were within normal values among most participants, and no significant differences were observed among work categories.

Conclusion: This study documented high internal exposure to several toxic metals depending on type of work and suggests a higher burden of respiratory symptoms in lixiviation workers. The absence of spirometric abnormalities can be explained by the relatively young age of this population of active workers. Nevertheless, the findings emphasize the need for occupational health measures to mitigate metal exposure and respiratory risks in copper and cobalt refining.

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The cooperatives:
Gatekeepers of the sites

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KEYWORDS. — Cooperatives; Artisanal Cobalt Mining; Vertical Governance.

ABSTRACT. — Since about a decade ago, when Congolese mining legislation required all artisanal and small-scale miners to group in cooperatives, mining cooperatives have come to play a crucial role in governing artisanal and small-scale mining in the DRC. While earlier studies have already criticized the process as being bureaucratically burdensome and captured by elite interests (De Haan & Geenen, 2015), more recent research has shown that the power of cooperatives is growing; as shown by Dunia Kabunga and Geenen (2022), in South Kivu's gold mines this rise has been a result of mechanization. In Lualaba province the position of cooperatives is also changing in the wake of the 'cobalt boom' and the spread of international supply chain initiatives. In this article we analyze recent changes in the governance landscape, focusing on the power of mining cooperatives. We specifically highlight their role as "gatekeepers" (mainly of information – as in the messages that international initiatives send to miners – and of funding) and as such, their relationships with the different categories of workers in the sites. We see a form of vertical (and hierarchical) governance being established in several of the sites we visited.

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Future making:
ASM formalization in the DRC's cobalt sector

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KEYWORDS. — Social Sciences; Qualitative Data; Katanga; Copperbelt.

ABSTRACT. — The DRC's cobalt has become a spear point of global policies and narratives envisioning sustainable futures. Simultaneously, cobalt mining is promised to be a source of socio-economic development for Congolese mining communities. However, while positive futures have been envisioned and promised for years, the realization of this potential remains absent. It is within this gap between potentiality and realization that diverse actors engage in attempts to create and/or control futures (Bryant & Knight, 2019). In this paper we analyze how the future is used to (re)shape everyday activities in the DRC's artisanal and small-scale cobalt mining (ASM) sector.

This paper is based on in-depth interviews conducted by the first author in and around Kolwezi during a total of four and a half months, in between 2023 and 2024. This data has been brought together with the extensive experience of the second author, including a survey carried out together with Stéphane Lumbu Maliba in the Kasombo mine (UCK Drain) near Kolwezi in November 2023.

We argue that future making in the DRC's ASM cobalt sector can be seen as a continuous tug-of-war game. While the (re-)emergence of ASM in the ruins of Gecamines in the 1990s can be seen as a strategy of former workers to create a future for their families, state and corporate-led ASM formalization efforts can be seen as hegemonic attempts at controlling these futures towards particular directions. However, the current lack of positive impact of formalization efforts has created a highly uncertain landscape. ASM actors are constantly navigating this uncertainty, while also using strategies to orient themselves towards the unknown future (Bryant & Knight, 2019; Vigh, 2009). By analyzing the interplay between hegemonic and counter-hegemonic attempts of future making, we are able to point to the multiple temporalities at play – a key element of understanding the lived realities and (lack of) impact of formalization efforts in ASM cobalt mining.

REFERENCES

BRYANT, R. & KNIGHT, D. M. (2019). The Anthropology of the future. Cambridge University Press.
VIGH, H. (2009). Motion squared: A second look at the concept of social navigation. *Anthropological Theory*, 9(4), 419-438.

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Management of Kipushi mining environments:
Involvement of local residents in phytostabilisation and cost evaluation in inhabited and uninhabited polluted areas

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KEYWORDS. — Phytostabilisation; Woody Sepecies; Cost; Amendment; Pollution; Copperbelt.

ABSTRACT. — The Katangan Copperbelt is a region rich in copper and cobalt deposit exploited since the beginning of the 20th century. An increase in the number of contaminated sites in cities and rural areas due to the intense mining activities coupled to elevated rate of demography has been reported. Nevertheless, phytostabilization is proven to be the most appropriate remediation strategy to rehabilitate this region thanks to its feasibility and benefits. Several studies have shown the interest of phytostabilization with woody species in these environments, but so far no study has been able to clarify the costs associated with the installation of plants in polluted environments and involve local residents in the rehabilitation of their environments affected by mining pollution. In this context, an amendment-assisted phytostabilisation trial was installed in the inhabited and uninhabited polluted environment and evaluated the costs incurred in relation to the environments and phytostabilisation strategies. Fifteen months after the installation of the trial, the results showed that in the inhabited environment, out of 184 trees distributed in 46 plots, 104 were recorded, about 83% of trees remaining on 100 %. This shows the motivation of local residents in the rehabilitation of their environment. It has also been shown that phytostabilization costs are reduced in inhabited areas with $774 compared to an uninhabited area with $1329. To phytostabilise large areas, a large amount of amendments are required, which entails enormous costs. However, an optimal quantity can be controlled that facilitates good plant performance at a lower cost. The use of a depth of 50 cm which requires 108kg of urban-waste soil/hole and 120t/ha giving a cost of $3057/ha can be affordable. This seems to be a good option that makes phytostabilis ation simple and less expensive in this Copperbelt region.

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Vernacular Knowledge and Local Resistance to Mining Extractivism in the DRC

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KEYWORDS. — Vernacular Knowledge; Mining; Local Resistance; Ituri (DRC).

ABSTRACT. — Mining activities in the Democratic Republic of Congo (DRC) have profoundly transformed territories, leading to environmental degradation, forced displacements, and shifts in power dynamics. While resistance to mining has been widely studied through the lens of social conflicts, the territorial knowledge underpinning these struggles remains largely overlooked. This presentation explores the so-called "vernacular" knowledge mobilized by local communities in Ituri, not as static traditions, but as constantly evolving knowledge systems rooted in struggles against extractivism.

Drawing on an ethnographic approach, this study examines how these forms of knowledge emerge, transform, and become political resources in response to mining-driven territorial changes. Whether through narratives about the sacredness of specific spaces, land reclamation strategies, or power reconfigurations involving armed groups, these knowledge systems contribute to redefining resistance and territorial claims.

By politicizing the notion of vernacular knowledge, this research moves beyond a folklorized perspective to interrogate its role in contestation and adaptation dynamics in the face of territorial transformations. It highlights how these knowledge systems shape local governance structures and influence community strategies amid increasing extractive pressures. Through this approach, this paper invites a rethinking of mining resistance, not only as acts of confrontation but also as processes of knowledge production and transformation regarding territorial practices and land use.

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POSTERS

Geology of the Isiro-Ngayu gold-bearing region, western belts of the Kibali granite-greenstone superterrane in the northeastern Congolese craton, Democratic Republic of Congo: Results of first field observations

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KEYWORDS. — Isiro-Ngayu Region; Congolese Craton; Gold-bearing Region; Field Observations; Kibali Granite-green Stones.

ABSTRACT. — The Isiro-Ngayu region is a band of two geological belts located in the western part of the Kibali granite-greenstone superterrane in the north-east of Democratic Republic of Congo. Beside the Isiro-Ngayu belts, the Kibali granite-greenstone superterrane comprises in its eastern part the large Kibali-Ituri gold deposit belts (Kagaraba-Chaffeur-Durba and Nizi-Kilo-Mongbwalo), one of world class known gold deposits, and the Mambasa belt in its southern part. The Kibalian granite-greenstone super-terrane dates back more than 2,500 Ma (Turnbull *et al.*, 2021), during the Archean, and is geologically composed of various rocks metamorphosed during the Archean period. These rocks commonly called "metasediments" have undergone several tectonic phases (folding, fractures and faults) as well as several phases of plutonic intrusions (Allibone *et al.*, 2020; Turnbull *et al.*, 2021).

The region was previously studied by Belgian geologists during the colonial period, though these investigations were broad and lacked detailed insights. This firt study revealed many gold deposits including the Kibali-Ituri ones. Since 2010, the Canadian mining firm LONCOR, has been engaged in the search for gold in the Ngayu belt. Loncor's work thus constitutes the first and most recent geological research in the Isiro-Ngayu region.

We carried geological fieldwork in the region during the period from January to September 2024. The study involved observing and describing rock outcrops, collecting samples, and conducting structural measurements. The work revealed several types of rocks constituting the metasediments, notably Bande Iron Formations (BIF), schists, quartzites and shales as well as several plutonic intrusions. About plutonic intrusions, four types of granitoids were observed ranging from those with a predominance of dark minerals to those with a prominence of light-colored minerals. Doleritic dykes are also observed and seem to mark the last phase of the intrusions. Several gold mineralized veins were observed, and their general orientation is NW-SE, except in the Matete locality where several orientations are observed, notably N-S, E-W, NW-SE etc.

The succession of granitic intrusion phases (even if their nature and ages are not known until now) as well as the tectonic phases that struck the region before these intrusions, explain the presence of gold vein mineralization. The petrographic (thin sections) and geochemical analyses currently being carried out should reveal the nature of these granites as well as other types of rocks, which will allow us to understand the geological processus which occurred in the region and the role it played in the establishment of gold mineralization.

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REFERENCES

ALLIBONE, A., VARGAS, C., MWANDALE, E., KWIBISA, J., JONGENS, R., QUICK, S., KOMAR-NISKY, N., FANNING, M., BIRD, P., MACKENZIE, D., TURNBULL, R., HOLLIDAY, J., 2020. Chapter 9: Orogenic Gold Deposits of the Kibali District, Neoarchean Moto Belt, Northeastern Democratic Republic of Congo, in: SILLITOE, R.H., GOLDFARB, R.J., ROBERT, F., SIMMONS, S.F. (EDS.), Geology of the World's Major Gold Deposits and Provinces. Society of Economic Geologists, p. 0. https://doi.org/10.5382/SP.23.09

TURNBULL, R.E., ALLIBONE, A.H., MATHEYS, F., FANNING, C.M., KASEREKA, E., KABETE, J., MCNAUGHTON, N.J., MWANDALE, E., HOLLIDAY, J., 2021. Geology and geochronology of the Archean plutonic rocks in the northeast Democratic Republic of Congo. Precambrian Research 358, 106133. https://doi.org/10.1016/j.precamres.2021.106133

Environmental hazards associated with mining activities in the tropics

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KEYWORDS. — Mining; Environmental Impact; Vulnerability; Remote Sensing, Republic Democratic of the Congo.

ABSTRACT. — Mining activities disturb the landscape directly at the mining sites and cause off-site environmental changes, sometimes kilometres away (road, settlements, deforestation, agricultural shifts) (Macháček, 2019; Depicker *et al.*, 2021; Geenen *et al.*, 2021; Verweijen *et al.*, 2022). Mining is also associated with health issues and geo-hydrological hazards (pollution, landslides) (Mwitwa *et al.*, 2012; Banza Lubaba Nkulu *et al.*, 2018; Nkuba *et al.*, 2019), which overall deepen the vulnerability of the population (Depicker *et al.*, 2021; Otamonga & Poté, 2020).

Using advanced Earth observation techniques, a multidisciplinary consortium led by the RMCA and including the CSL, ITC and the IOB has developed the EDITOR project (Environmental hazards associated with mining activities in the tropics) in close collaboration with local institutions.

EDITOR aims to address the issue of environmental changes related to increased mining activities driven by global demand for metals, notably in the context of global climate change commitments and implementation of 'green' technologies, and mining-related social impacts, such as rapid demographic increase and land use changes, which so far remain either understudied or possibly underestimated in the targeted region, eastern DR Congo.

EDITOR builds on the use of remote sensing (hyperspectral, radar, and optical satellite imagery), as well as relevant archives. The remote sensing approach is motivated by the spatial extent of the study area and the lack of field data.

The societal scope in that densely populated region challenges EDITOR to better characterise the specific vulnerability linked to the mining induced environmental changes (MIEC), and will therefore benefit from the expertise and methods of the social sciences.

Assessing MIEC is of vital importance if we are to integrate sustainability into development strategies, ecosystem management, and land and underground use planning, particularly in developing countries where changes are occurring rapidly and have devastating consequences for both humans and nature.

REFERENCES

BANZA LUBABA NKULU, C., CASAS, L., HAUFROID, V., DE PUTTER, T., SAENEN, N.D., KAYEMBE-KITENGE, T., MUSA OBADIA, P., KYANIKA WA MUKOMA, D., LUNDA ILUNGA, J.M., NAWROT, T.S., LUBOYA NUMBI, O., SMOLDERS, E. & NEMERY, B., 2018. Sustainability

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of artisanal mining of cobalt in DR Congo. Nature Sustainability 1, 495–504. Doi:10.1038/s41893-018-0139-4

DEPICKER, A., JACOBS, L., MBOGA, N., SMETS, B., VAN ROMPAEY, A., LENNERT, M., WOLFF, E., KERVYN, F., MICHELLIER, C., DEWITTE, O. & GOVERS, G., 2021. Historical dynamics of landslide risk from population and forest-cover changes in the Kivu Rift. Nature Sustainability 4, 965–974. DOI:10.1038/S41893-021-00757-9

GEENEN, S., STOOP, N. & VERPOORTEN, M., 2021. How much do artisanal miners earn? An inquiry among Congolese gold miners. Resources Policy 70, 1–30. Doi:10.1016/j.resourpol.2020.101893

MACHÁČEK, J., 2019. Typology Of Environmental Impacts Of Artisanal And Small-Scale Mining In African Great Lakes Region. Sustainability 11. DOI:10.3390/SU11113027

MWITWA, J., GERMAN, L., MUIMBA-KANKOLONGO, A. & PUNTODEWO, A., 2012. Governance and sustainability challenges in landscapes shaped by mining: Mining-forestry linkages and impacts in the Copper Belt of Zambia and the DR Congo. Forest Policy and Economics 25, 19–30. Doi:10.1016/j.forpol.2012.08.001

NKUBA, B., BERVOETS, L. & GEENEN, S., 2019. Invisible and ignored? Local perspectives on mercury in Congolese gold mining. Journal of Cleaner Production 221, 795–804. Doi:10.1016/j.jclepro.2019.01.174

OTAMONGA, J.P. & POTÉ, J.W., 2020. Abandoned mines and artisanal and small-scale mining in Democratic Republic of the Congo (DRC): Survey and agenda for future research. Journal of Geochemical Exploration 208, 106394. Doi:10.1016/j.gexplo.2019.106394

VERWEIJEN, J., SCHOUTEN, P., SIMPSON, F.O. & CHAKIRWA ZIRIMWABAGABO, P., 2022. Conservation, conflict and semi- industrial mining: the case of eastern DRC. Analysis and policy brief - University of Antwerp 49, 11.

Dietary intake of cobalt and lead in the mining region of Katanga

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KEYWORDS. — Lead; Cobalt; Dust; Food; Daily Intake.

ABSTRACT. — After having documented a high amount of involuntary dust ingestion among residents living in various areas in and around Lubumbashi (Smolders et al. 2019), we assessed, from the same study, the dietary intake of trace metals, with a focus on cobalt (Co) and lead (Pb)i.

Four consecutive days duplicate meals were obtained from 120 participants (54 households) and 51 participants (38 households) in the dry and rainy season, respectively; 89 and 38 participants lived close to mining activities [contaminated areas (CAs)] and 31 and 13 participants lived far from mining [reference areas (RAs)]. Trace metals were measured by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) in food and surface dust.

In both seasons, geometric concentrations (GM) of Co in food were twice higher in CAs (200 and 222 µg/kg) than in RAs (94 and 100 µg/kg), whereas Pb in food was twice lower in CAs (77 and 61 µg/kg) than in RAs (112 and 143 µg/kg). Dust and food levels correlated for Co but not for Pb. Estimated daily intake values (GM) of Co were 41 and 46 µg/day for children and 50 and 63 µg/day for adults for Co (in CAs), and for Pb 38 and 49 µg/day for children and 42 and 52 µg/day for adults (in RAs). These values are substantially higher than the Interim Reference Levels (IRLs) established by the US Food and Drug Administration, i.e. 2.2 µg/day for children, 8.8 µg/day for females of child-bearing age, and 12.5 µg/day for adults.

The concentrations of Co in food were consistent with the amounts of Co found in dust, which depended on proximity to cobalt mining activities. However, the elevated concentrations of Pb in food did not parallel those found for Co, thus suggesting that food contamination by Pb originates from sources beyond local mining-related activities.

REFERENCE

SMOLDERS, E., ROELS, L., KUHANGANA, T.C., COOREVITS, K., VASSILIEVA, E., NEMERY, B. & LUBABA NKULU, C.B., 2019. Unprecedentedly High Dust Ingestion Estimates for the General Population in a Mining District of DR Congo. Environmental Science & Technology. 53, 7851–7858. https://doi.org/10.1021/acs.est.9b01973

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Artisanal mining as a socioeconomic lifeline in Rubaya: Factors of dependence and sustainable alternatives

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KEYWORDS: — Artisanal Mining; Disaster Risk Reduction; Sustainability

ABSTRACT: — The international demand for strategic minerals such as coltan, cobalt, and lithium has driven the rapid expansion of artisanal mining in eastern Democratic Republic of Congo (DRC). This demand has also spurred the birth and growth of towns like Rubaya, which rely heavily on artisanal mining.

This study investigates the dual role of artisanal mining in Rubaya, eastern DRC, as both a critical economic lifeline and a source of significant risks. With over 10 million Congolese dependent on this sector, the research highlights the explosive growth of mining towns, the population's reliance on strategic minerals, and the adverse effects of mining accidents and environmental degradation. The aim is to explore how these dynamics affect local livelihoods and to assess the challenges faced by miners in transitioning to alternative economic activities.

Utilizing qualitative methods, including field observations and interviews with local miners and stakeholders, the findings reveal that informal mining operations contribute to urbanization while simultaneously exacerbating disaster vulnerabilities and environmental harm. This study documents recurring mining accidents and land degradation due to artisanal mining activity. The analysis underscores the barriers to diversification into agriculture and other sectors due to land competition, capital deficits, and skills mismatches among miners.

This research emphasizes the need for integrated strategies that promote formalization of artisanal mining, environmental remediation efforts, and skills development to foster sustainable livelihoods in Rubaya. The implications of this study are significant for policymakers aiming to balance economic growth with disaster risk reduction and environmental sustainability in resource-rich regions.

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Domestic indoor radon exposure in Lubumbashi, DR Congo

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ABSTRACT. —

Background/ Purpose

The (former) Katanga province of DR Congo hosts many copper-cobalt mines and refining plants that are past and current sources of environmental pollution. The cobalt deposits are also rich in uranium, the decay of which leads to emissions of gaseous radon. We investigated indoor radon exposure in urban neighborhoods with different degrees of pollution from metal refineries.

Methods

In a cross-sectional study (June–August 2023), we measured indoor radioactivity using a radon detector device with instant reading (RadonEye RD200) in 180 houses in neighborhoods with industrial pollution (Ruashi and CDM) and 350 control houses in neighborhoods without refineries (Kalubwe and Maramba). Households were selected by convenience sampling.

Results

Geometric Mean radon concentrations (Bq/m^3) with ranges were 89 (15-1071) in exposed neighborhoods and 55 (7-531) in the control area. In the exposed area, 40 % of homes exceeded the WHO acceptable limit in the general environment (100 Bq/m^3), compared to 21% in the control area. In a multivariable analysis, households with indoor radon >100 Bq/m3 were significantly associated with proximity to metal refineries (1000 m) [aOR 3.3 (2.1–5.4), P<0.001].

Conclusions

In this cross-sectional study, we found evidence of high exposure to radon in households close to metal refineries in Lubumbashi. The health impact of this exposure to ionizing radiation must be further investigated.

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Evaluation de l'impact des activités minières sur les ressources halieutiques et leur environnement dans le Grand Katanga en République Démocratique du Congo

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MOTS-CLÉS. — Halieutique; Abondance relative; TDS; Lac Lukushi; Lac Sangwa; Conductivité; Luilu.

RÉSUMÉ. — Les activités minières constituent un socle pour le développement économique et social pour bon nombre de pays. Cependant la réalisation de ces activités s'accompagne d'impacts environnementaux, sanitaires et sociaux importants.

Objectif: cette étude a pour objectif d'évaluer les impacts des activités minières du cuivre, du cobalt et de l'étain sur la santé des poissons et leur environnement dans le bassin versant du fleuve Lualaba supérieur (Fleuve Congo: de Kolwezi à Kongolo).

Méthodologie: des échantillons d'eau et poissons ont été prélevés dans un lac proche des installations minières (Lac Tshabula), deux lacs assez éloignés (lacs Lualaba et Nzilo), une rivière réceptacle d'effluents miniers (rivière Luilu) à Kolwezi (extraction de cuivre-cobalt), un lac directement affecté par les activités minières (extraction d'étain) passées dans la cité de Manono (Lac Lukushi), et un lac témoin (Lac Sangwa à Muyumba port). Au total 92 échantillons d'eau et 1232 échantillons de poissons ont été prélevés. Sur chaque échantillon d'eau, la température, le pH, la conductivité et le TDS ont été déterminés grâce à un appareil électronique (Pen type water quality meter). Les poissons ont été identifiés grâce à la clé de Paugy et al. (2003) et Vreven at al. (2012), et l'abondance relative calculée pour chaque site.

Résultats: Les valeurs suivantes ont été obtenues pour les paramètres physicochimiques de l'eau: pH 5.99 (Luilu), 7.57 (Tshabula), 8.20 (Lualaba), 7.93 (Nzilo), 7.02 (Lukushi) et 7.93 (Sangwa); Température (°C) 24.58 (Luilu), 25.40 (Tshabula), 25.61 (Lualaba), 24.94 (Nzilo), 25.92 (Lukushi) et 26.90 (Sangwa); Conductivité (µS/cm) 4065 (Luilu), 1687.33 (Tshabula), 582.83 (Lualaba), 427.23 (Nzilo), 22.38 (Lukushi) et 399.29 (Sangwa); TDS (ppm) 1019.67 (Luilu), 837 (Tshabula), 290.44 (Lualaba), 210.62 (Nzilo), 10.91 (Lukushi) et 201.57 (Sangwa). Les résultats de l'abondance spécifique des 1232 spécimens de poisson regroupés en 7 ordres, 13 familles et 27 espèces se résument comme suit: Luilu (0), Tshabula (5), Lualaba (5), Nzilo (7), Lukushi (11) et Sangwa (18). Les valeurs des paramètres physicochimiques sont décroissantes en fonction de l'éloignement des installations minières tandis que l'abondance spécifique évolue dans le sens contraire.

Conclusion et application des résultats: Les résultats de cette étude démontrent que les activités minières impactent négativement la santé des poissons et leur environnement dans le grand Katanga. Les résultats des concentrations d'éléments traces métalliques dans les muscles expliciteront cette hypothèse.

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Behavioral Problems in Children Working in Kolwezi's Artisanal Copper-Cobalt Mines

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KEYWORDS. — Mental Health; Child Dvelopment; Mining Hazards; Social Impact.

ABSTRACT. —

Background/purpose: According to the latest research by the United Nations Children's Fund (UNICEF), from 2014 roughly 40,000 young boys and girls were used for dangerous mining activities in southern DR Congo, primarily extracting cobalt. We investigated trace metal exposure and possible behavioral problems among child miners in copper and cobalt artisanal mines around Kolwezi.

Methods: In a cross-sectional study conducted in January 2020, we compared 40 children (9-11 y) working in an artisanal surface mine in Tshabula around Kolwezi, with 43 control children working in farming in Lubango (50 Km from Kolwezi). We administered a behavioral screening questionnaire, the Strengths and Difficulties Questionnaire (SDQ), to their parents after receiving their consent. Concentrations of 25 trace metals were measured by inductive coupled plasma - mass spectrometry in spot samples of urine.

Results: Geometric mean (GM, with IQR) urinary concentrations (µg/g creatinine) of cobalt were 4.7-fold higher in child miners [31.7 (16.1-50.9)] than in child farmers [6.9 (4.1-10.2)]. Urinary manganese (Mn) concentrations were 2.6-fold higher in miners [6.8 (3.2-14.4)] than farmers [2.6 (1.1-6.1)]. Median SDQ scores showed more hyperactivity [7 (5-7.3)] and sociability problems [3 (3-4)] among miners than among farmers [4 (3-5) and 8 (6-9), respectively]. However, within the group of child miners inverse correlations (Spearman) were found between urinary Mn concentrations and conduct problems (r=-0.52, p=0.001) and also total difficulties (r=-0.41, p=0.008).

Conclusions: In this cross-sectional study, we found evidence of higher exposure to trace metals, especially cobalt and manganese, in children working in mines than in children working in farming. We also found inverse correlations, among child miners, between behavioral problems and urinary concentrations of Mn, a neurotoxic metal present in the ores mined in the region. The significance and mechanisms of the latter counter-intuitive observation need further investigation.

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Erectile Dysfunction in Copper-Cobalt Miners: A Cross-Sectional Study in Katanga, DRC

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KEYWORDS. — Copperbelt; global health; male sexual health; mining metals.

ABSTRACT. — The African Copperbelt is a site of intense artisanal and industrial mining and refining of copper and cobalt. We aimed to investigate factors that are possibly associated with erectile dysfunction (ED) in metal miners in the former Katanga province of the Democratic Republic of the Congo.

In a cross-sectional study of 138 miners (working in various areas of the Copperbelt) and 139 controls (bakers), we administered questionnaires to obtain sociodemographic and occupational data and to assess male sexual function (International Index of Erectile Function [IIEF]) and marital relation quality (Revised Dyadic Adjustment Scale). Furthermore, we measured trace metals in blood and urine, as well as testosterone and thyroid hormones in serum.

Miners were on average 4 years older than bakers (mean ± SD, 37.5 ± 6.9 vs 33.3 ± 5.7 years). Miners had significantly lower scores than bakers on the IIEF (median [IQR], 66 [49-73] vs 73 [66-74]) and the 3 domains of the Revised Dyadic Adjustment Scale (consensus, satisfaction, cohesion). Free testosterone was significantly lower in miners than bakers (ng/dL; 8.11 [6.90-10.10] vs 10.52 [8.83-12.58]; P < .001). In miners, sex hormone-binding globulin correlated positively with blood Pb and urinary Cd. In a multivariable analysis, mild to moderate ED or moderate ED (IIEF-erectile function score ≤18) was significantly associated with having a mining-related job (adjusted odds ratio [aOR], 2.6; 95 % CI, 1.3-5.3), work seniority >5 years (aOR, 2.3; 95 % CI, 1.1-4.6), alcohol consumption (aOR, 2.8; 95 % CI, 1.2-6.7), and aphrodisiacs use (aOR, 4.2; 95 % CI, 2.2-8.0). Media-tion analysis showed that marital relationship partially mediated the relation between work seniority >5 years in mining and ED.

As compared with controls, miners reported poorer sexual function and lower quality of their marital relationship, and they had lower free testosterone levels, which may be due to their high exposure to trace metals.

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Hypoxaemia and risk of asphyxia during underground work in artisanal cobalt mines

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KEYWORDS. — Occupational safety, respiratory health, gas exposure, mining hazard
ABSTRACT. —

Background/purpose: More than half the cobalt needed for vehicle electrification originates from the southern part of the Democratic Republic of the Congo (DRC), with a substantial part being extracted by artisanal miners.To investigate oxygen saturation during underground work among cobalt artisanal miners.

Methods: In a field survey, we measured oxygen saturation (SpO2) and heart rate by pulse oximetry in 86 miners from two underground mines and 24 miners from a surface mine at four different time points: before descent into the mine (T1), at 50 minutes in the mine (T2), upon leaving the shaft (T3), and 10 minutes after having left the mine (T4).

Results: Miners working underground (-36 to -112 meters) were somewhat older (34.8 ± 6.7 years) than those working in the surface mine (32.0 ± 6.5 years), and they worked more hours daily (12.6 ± 1.2 hours) than controls (9.0 ± 0.0 hours). All participants had SpO2 >95 % at T1 and T4. At T2, SpO2 dropped below 93 % and 80 % in 35 % and 10 % underground miners, respectively; SpO2 was still <93 % at T3 in 13 %. SpO2 remained stable among surface miners. Later, we showed that underground ambient oxygen levels decreased well below 21 % in several pits.

Conclusions: Pulse oximetry revealed relevant hypoxaemia during underground work in a substantial proportion of artisanal miners. Such hypoxaemia without evidence of underlying cardiovascular disease is indicative of low ambient oxygen, due to insufficient mine ventilation. This may cause deaths from asphyxia. The hazards of low ambient oxygen in artisanal mines must be prevented by appropriate technical measures ensuring the supply of sufficient fresh air.

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Social environmental impacts of the exploitation of energy transition minerals in Lualaba and Haut Katanga in DRC: Analysis of the practices of Mining companies and state actors in the implementation of the law that govern the mining sector

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KEYWORDS. — Greenwashing Practice; Tendency to Reductionism and Legal Positivism; Corruption of Actors Involved; Intimidations of Victims and Civil Society Actors.

ABSTRACT. — Local and international NGOs and researchers have documented cases of social environmental impacts of mining activities calling for concrete actions from the Congolese government, companies, and international actors who source critical minerals coming from the DRC (Raid & Afrewatch 2024, Resource Matters, Banza Lubaba Nkulu & Nemery 2019, IPIDHOR 2023 & 2024, ACIDH, Afrewatch, PremiCongo 2021). Very often, the documentation of pollution cases relies on testimonies from victims or local communities living around businesses due to the difficulties of documenting them with scientific evidence based on laboratory analyzes of water, air and blood samples...The lack of this type of scientific evidence works to the advantage of companies who often reject accusations of alleged cases of pollution decried by local communities and civil society organizations as well as the NGOs that support them, thus leaving the victims of pollution continue to suffer and endure. In view of the current debates around social environmental impacts, this presentation aims to contribute with a reflection on the reasons behind the lack of mitigation of impacts, repair of damage caused as well as compensation for victims. We show that companies take advantage of the Congolese government's weaknesses in the implementation of the law that govern the mining sector. Instead of respecting the law in order to mitigate and manage the environmental impacts of their projects, they prefer to circumvent the law through different practices.

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The hidden legacy from the manufacture of asbestos-cement in DR Congo

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KEYWORDS. — Environmental Health; Asbestos Exposure; Geology; DR Congo.

ABSTRACT. — Asbestos is a global threat. However, little is known about the past and current sources of asbestos exposure in Africa. Following the discovery of three cases of asbestos-related diseases (peritoneal malignant mesothelioma, pleural malignant mesothelioma, asbestosis) in the former Katanga, we aimed to describe sources of asbestos exposure in DR Congo.

Methods: Non-systematic surveys were undertaken in various locations of the former Katanga province and in Kinshasa, where asbestos-cement plants operated: TRABEKA in Lubudi (1929 to 1977) and ETERCO in Kinshasa (1949 to 2010). Samples of building materials were analysed for the presence and identification of asbestos fibers by Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray (EDX) spectroscopy in the asbestos laboratory of IBEVE (Antwerp, Belgium).

Results: Visits to various mining towns in the former Katanga province and in Kinshasa confirmed the widespread presence of "Eternit" sheets covering thousands of houses, with many roofs being in a visibly poor state, as well as dump sites. Corrugated sheets presumably manufactured by TRABEKA contained both chrysotile and crocidolite, whereas only chrysotile was found in asbestos materials from Kinshasa. Besides being present in asbestos-cement building materials, chrysotile was also identified in car brake lining obtained in Lubumbashi. Moreover, samples of Riebeckite collected from a mining area in the Lualaba province consisted of crocidolite fibers.

Conclusion: The true legacy of the past and current asbestos exposure in DR Congo, is still unknown. Efforts must be done to devise and implement environmental and occupational policies, and train experts for asbestos detection and renovation in old buildings.

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Rapidly progressive silicosis masquerading as tuberculosis in cobalt mine workers

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KEYWORDS. — Chronic Respiratory Diseases; Case-series; DR Congo.

ABSTRACT. — Silicosis with or without TB remains the most important occupational lung disease worldwide. However, the condition is not often diagnosed, even in the Katangan Copperbelt, an area of intense mining in DR Congo. To increase awareness among clinicians and others that chronic respiratory disease is not always TB, we describe two sentinel cases of silicosis initially diagnosed as TB.

We analysed the medical and occupational history of two patients with probable pneumoconiosis identified in a public hospital in Kolwezi, when preparing a case-control study into occupational respiratory disease. Case #1 (40y) and Case #2 (23y) were non-smoking men who had been admitted, in May 2023, with chronic cough, dyspnoea and chest pain and were treated for pulmonary tuberculosis (without bacteriological evidence in Case #1). Chest x-rays read according to the ILO International Classification of Radiographs of Pneumoconioses showed small opacities (q/q; 2/2) and a larger opacity (A) next to the left heart border in Case #1, and diffuse small round opacities (r/q; 3/2) with larger opacities (B) in the left upper zone, in addition to a cavity and background ground glass opacities in Case #2. Both men had worked only for four and three years as ore-crushing operators in industrial surface mines, with unprotected exposure to mineral dust, presumably rich in silica (37 % quartz was measured by X-ray diffraction analysis of settled dust obtained from ore-crushing operations in an industrial mine in Kolwezi). Despite treatment for TB, Case #2 died in acute respiratory failure in June 2023.

Large case-control studies have been initiated to assess the contribution of mining to the burden of tuberculosis and other chronic respiratory disease in the Lualaba and Haut Katanga provinces. Efforts must be done to protect worker health and diagnose occupational diseases in the mining areas of the DR Congo.

NOTE

An article describing these case reports is in press in the International Journal of Tuberculosis and Lung Diseases (IJTLD-Open).

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