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Cobalt mining and the corporate outsourcing of responsibility in the Democratic Republic of Congo

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ABSTRACT

The consumption of cobalt has tripled globally over the last decade, largely driven by rising demand for electronics and electric-battery vehicles. This fast-growing market has pressured multinational mining companies operating in the Democratic Republic of Congo, the world's largest supplier of cobalt, to formalize artisanal mining under the banner of responsible sourcing. Based on field research in the cobalt-rich Province of Lualaba, survey data and interviews with relevant actors, this article examines the integration of artisanal miners in corporate-led formalization projects. First, we suggest that the reliance on wageless artisanal workers in large-scale industrial operations holds important lessons for understanding the unintended effects of mining formalization. Second, the flexible recruitment of artisanal workers by mining companies represents an emergent trend of corporate outsourcing of responsibility.

1. Introduction

The consumption of critical minerals and metals such as cobalt has expanded dramatically in response to decarbonization efforts and the growing prevalence of digital technologies and electric battery vehicles. Over the course of the last decade alone, global demand for cobalt has tripled, and is set to double again by 2035 (The Faraday Institution, 2020). This is largely due to cobalt's ability to deliver unparalleled power, performance, and safety in the lithium-ion batteries required by electric battery vehicles (Banza Lubaba Nkulu et al. 2018, 495). Along with ethical and responsible sourcing initiatives, this unprecedented demand has considerably disrupted the supply chain for critical resources, from the so-called "3Ts" (tin, tungsten and tantalum) to cobalt. In the pursuit of reputational benefits and to guarantee a steady supply of cobalt, mining corporations have spearheaded efforts to formalize the artisanal mining sector in the Democratic Republic of Congo (DRC). This article examines the unintended effects of these corporate-led formalization efforts in the cobalt sector.

Cobalt mining in southern DRC, extracted through both artisanal and industrial means, is exemplary of two emergent trends in the extractive industries leading the "energy transition" (Bazilian, 2018). The first entails the "responsible" integration of artisanal sources in formalization schemes. Following World Bank recommendations that mining companies should engage with the artisanal sector, corporations are increasingly expected to take part in efforts to formalize the sector. In the race to secure viable long-term cobalt sources, corporate actors in the trading, electronics and mining sectors have moved beyond existing partnerships with cooperatives and non-governmental organizations (NGOs) to lead the inclusion of wageless artisanal workers, paid by production output without a base salary or other social protection mechanisms. The second trend, which we define as the "corporate outsourcing of responsibility," describes the shift in responsibility and extraction risks away from corporations and onto miners themselves. These new corporate-sponsored wageless labor pools circumvent and outsource all forms of social protection that would rightly "secure" the capacity of workers for decent living conditions.

The article assesses how the corporate project of formalizing wageless pools of artisanal miners may pave the way for an emergent tendency of corporate outsourcing of responsibility. As we will demonstrate with cobalt mining in the DRC, corporate actors have been tapping into the relative surplus value of artisanal sourcing. What is new about this moment is the imposition of formalized artisanal mining as an integral

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element of corporate-led formal supply chains for reputational and commercial reasons. This is a critical inquiry in that the country is the world's largest supplier of cobalt, with upwards of 20–30% being sourced artisanally.[1] Based on three cases where large-scale mining operators deploy – without necessarily employing – an artisanal workforce in their operations, we ask: What are the changing labor conditions following the shift from autonomous workers to *de facto* wageless, corporate contractors? And what is the impact of corporate-led formalization in the artisanal mining sector? An answer to these questions requires attention to the technical challenges of artisanal and industrial cobalt extraction, the organization of work, and the relation between capital and labor as it underpins these peculiar "formalized" entanglements in so-called "responsible supply chains" (OECD, 2016). To do so, we mobilize and extend the scholarship on human security, wageless work, and corporate social responsibility.

Expanding the human security framework through the lens of mining labor, this article combines studies of formalization developed under the sway of large-scale mining operations with recent scholarship on corporate sustainability and social responsibility. The literature concerned with formalization has detailed the social, economic and institutional barriers of legalization (Machonachie and Hilson, 2011; Tschakert, 2009), with an attendant concern over miners' marginalization, exploitation and vulnerability (Fisher, 2007; Sovacool, 2019). While formalization programs hold important benefits for the lives of artisanal miners, such as physical safety or protection from violence, our approach to human security allows for a critical evaluation of the role of mining corporations in setting in motion wageless working conditions. In doing so, we hope to spark discussion on the importance of a holistic and inclusive view of formalization strategies. Second, we contribute to the critical literature on corporate social responsibility (CSR) by examining how mining companies invoke responsible sourcing and due diligence mechanisms as a means to seize the potential of artisanal mining and appease sustainability requirements. Recent scholarship has skillfully documented how companies engage with non-corporate actors, including state agencies, local communities, and non-governmental organizations (Dolan and Rajak, 2016; Welker, 2014; Golub, 2014), as well as how the actors of CSR and sustainability programs "navigate" this landscape (Archer, 2020). It has been further demonstrated that corporate actors resort to a managerial ethic of "detachment" (Cross, 2011) to avoid being accountable for the welfare of the population (Gardner, 2012), and in the case of Guinea, may even outsource the costs of such programs to governments through debt and the arbitrary reallocation of royalties (Bolay and Knierzinger, 2021). This article highlights a novel configuration in which corporate responsibility is outsourced to workers themselves. In so doing, companies shift the risks, costs, and responsibility toward wageless workers organized in corporate-sponsored cooperatives.

This paper builds off of research drawn from a combination of data and different methodological strategies. First, ethnographic data was collected in two separate visits to the Kolwezi mining region of the DRC, in March and September 2019, under the auspices of UNIKOL (University of Kolwezi) and research credentials by relevant provincial ministries and police authorities. The mining region located along the Copperbelt of the DRC and Zambia was selected as it is the current epicenter of the global production of cobalt, with a significant preponderance of artisanal production. A total of eight mining sites were visited, representing a variety of concessionary authorities, geological sources (mixed copper and cobalt, tailings, and sterile deposits), as well as dual Artisanal and Small-scale Mining (ASM) and corporate engagement. During each visit, the authors collected mapping information, basic sociological data on miners, and information on cooperative and taxation regimes. For the purpose of this article, we focus on three case studies of artisanal mining organized under the auspices of mining corporations (Fig. 1). Second, this article relies on a survey conducted among artisanal miners (*n* 81), gathering information on their revenue, mining trajectory and choice of mining site, level of commitment and membership with cooperatives, preferred mining resource and method of sale. Third, data was complemented with interviews with relevant stakeholders in the cobalt economy – including local politicians, civil society and NGO representatives, journalists, and corporate actors – as well as participation in relevant *fora*, such as the 2019 Responsible Mineral Supply Chains Forum organized by the Organization for Economic Cooperation and Development (OECD).[2] Finally, we draw upon academic literature and documentary sources, including the mining record for DRC, relevant reports, and media accounts.

In what follows, we first describe three of the so-called "model mines" where multinational corporations have led the formalization of artisanal miners. This background frames artisanal mining within debates on human security. We set the vulnerability and precarious flexibility of these livelihoods against the backdrop of efforts to "responsibly" formalize artisanal mining. The article then accounts for the dual effect of wageless work in industrial mines to conclude on the corporate outsourcing of responsibility as it emerges from these formalization efforts.

2. "Model mines" and the emergence of mixed mines

Despite its political and economic insecurity, the DRC remains the primary source of cobalt for the majority of transnational corporations in the electronics and electric battery vehicle industries. Once considered a companion or by-product metal in the extraction of primary ores of copper or nickel, cobalt oxidized ore has become a strategic mineral in its own right (Olivetti et al., 2017: 229). Requiring anywhere between 10 and 15 kg of cobalt to produce an electric vehicle battery, and some 10 g for a smart phone, global demand has placed unprecedented pressure on cobalt supplies (Rodrik, 2019), 70% of which is extracted in southern DRC in the provinces of Lualaba and Haut Katanga (USGS, 2020:51). Home to high-ore grade surface veins, cobalt sources are easily accessible without industrial and mechanized methods, and are inevitably reached by artisanal miners. As we were told by a representative of an international NGO partnering with large-scale mines in Kolwezi, DRC, "there is no future where there is no ASM."[3] In other words, despite NGO's efforts to improve local livelihoods by providing an alternative to artisanal mining, there was a tacit acknowledgment of ASM's inescapability. Left with few viable alternatives and facing the possibility of consumer boycotts, transnational embargos, and further reputational risk, transnational corporations have begun engaging with the Congolese artisanal sector.

The 2011 OECD Guidelines (2016), the blueprint for most extractive industry associations, paved the way for an articulation between the artisanal sector and corporate actors across mineral supply chains. In turn, the World Bank, with the support of the extraction lobby of the International Council on Mining and Metals, also actively promoted forms of engagement with artisanal mining with the motto that "governance is cheaper than defense" (World Bank. 2009). The implementation of these guidelines and title XV of the US Dodd-Frank Act

[1] Estimates vary considerably, from 20% to 30% (Al Barazi et al., 2017, Rubbers, 2019: 9, BGR, 2019) and up to 40% according to Todd Frankel's story for the Washington Times ("The Cobalt Pipeline", September 30, 2016). We follow the more modest but credible estimates, which still represent a very significant share of the world's production.

[2] We anonymize the identity of interviewees and follow Chatham House Rules, when applicable.

[3] September 2019. The organization is active in the region to ensure a modicum of working and living conditions for artisanal miners, and offered a sceptical outlook on the effectiveness of the so-called "model mines" described in this article.

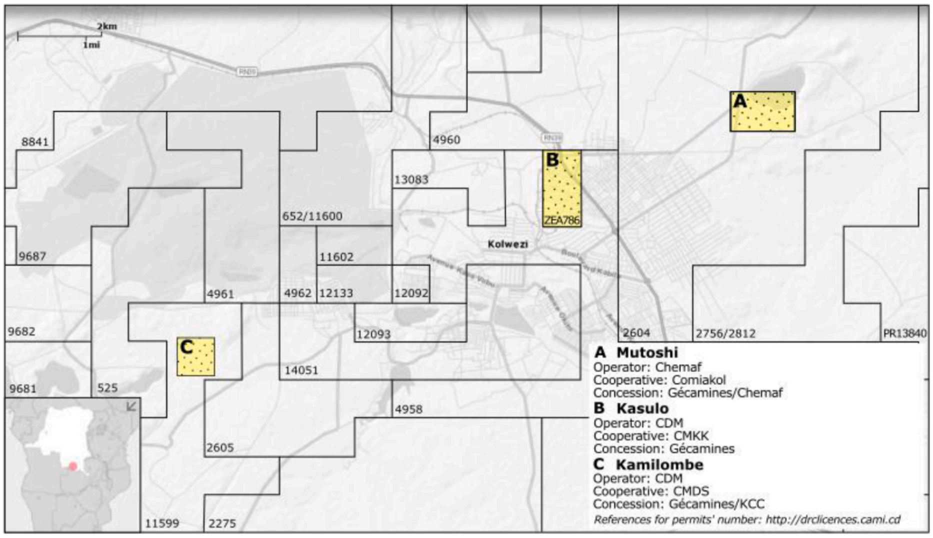

Fig. 1. Location of Mutoshi, Kasulo, and Kamilombe in Kolwezi, DRC.

(2010), mandating the disclosure of so-called "conflict minerals" sourced from the DRC, have been central to fostering the formalization of DRC's ASM sector, with increased attention directed to the cobalt industry in an effort to ensure safer and fairer global supply chains.[4] The 2016 release of the Amnesty International Report "This is what we die for,"compounded by the December 2019 lawsuit filed in the United States against tech companies for the use of child labor in cobalt mines, brought further attention to the cobalt industry's complex and globalized supply chain.[5] These revelations engendered widespread media attention and calls for consumer action, pressuring companies downstream to investigate their contractors and subcontractors more thoroughly to avoid any further reputational and material risks, and leading to the creation of "model mines" where artisanal miners could mine in conditions deemed secure within corporate concessions.

The three cases of corporate-led formalization described below are based on different legal arrangements, forms of technical cooperation, financial agreements, and practices of due diligence. More than in reaction to the conflicts inherent to the DRC's plural legal regime and "authorized" and "unauthorized" mining (Katz-Lavigne, 2020), these "responsible" mining schemes all respond to growing market pressure for cobalt sourcing by offering a licit route for artisanal sources in corporate supply chains. In these "mixed" mines, artisanal miners are not only entangled by a force of needs but have been formally integrated by large-scale mining operators.

2.1. *Mutoshi cobalt*[6]

Trafigura, one of the world's largest commodity trading companies, entered in 2017 into a three-year marketing agreement with Chemicals of Africa (heretofore Chemaf), a cobalt and copper mining company established in the DRC in 2002. With Chemaf's consent, Trafigura put in place a permanent formalization project to ensure comprehensive risk mitigation. More than a philanthropic gesture, the pilot project represented a commercial venture with the aim of ensuring low-risk and sustainable business practices.[7] The pilot project was implemented at Mutoshi Cobalt, part of the larger Mutoshi concession, to promote the controlled formalization of artisanal mining through stringent monitoring and assurance mechanisms. To reduce reputational damages and provide onsite monitoring, Trafigura enlisted the American NGO Pact to launch the project in January 2018. By law, companies can only engage with artisanal miners if they are organized in cooperatives, and Trafigura and Pact decided to work with the mining cooperative of Kolwezi (COMIAKOL), authorized by the DRC Regulatory Authorities to operate within a demarcated area of the concession, as the partner at the site. COMIAKOL members come from the local community and the cooperative was already in the process of obtaining a mining license at the time of the project's initiation.[8]

Today, approximately 5200 artisanal miners are registered with the cooperative. This number can fluctuate dramatically depending on the price of cobalt, with only 1080 miners being present in late April 2019 compared to nearly 5000 in March 2019.[9] In order to gain access to the site, workers must display a valid Congolese ID card to ensure they are over 18 years of age, and be randomly tested for drugs and alcohol.[10] Site inspections are conducted by Chemaf, the Service for Assistance and Supervision of Artisanal and Small-Scale Mining (SAEMAP), COMIAKOL, and Pact. Risk assessments are conducted weekly, and medical and onsite training occurs on a regular basis. The project is also assessed quarterly by a consulting company in line with OECD Due Diligence Guidelines (Johansson de Silva et al., 2019). In order to ensure that regulations are enforced and standards met, Chemaf works closely with the head of the community cooperative and the state regulator for ASM.

Labor remuneration and differential payment systems remain a notable challenge. Chemaf and COMIAKOL have negotiated a price agreement for the cobalt produced at the Mutoshi mine, and Chemaf has committed to purchasing all of the cobalt produced by COMIAKOL workers. This offers only partial protection against market prices

[4] Although cobalt is not classified as a conflict mineral, OECD's Annex II identifies the need for companies to respect human rights and avoid contributing to conflict through their mineral supply chains. We take up this concern further by examining its impact in working conditions and the organization of mining labor.

[5] As of May 2020, in response to this class-action lawsuit, Huayou Cobalt has decided to temporarily suspend its practice of buying cobalt sourced by artisanal miners. The impact of this decision, further compounded by the effects of COVID-19 and lower cobalt prices, remains to be seen, although it strengthens the argument proposed in this article, namely by imperilling the tenuous lifeline for the artisanal miners heretofore working under its responsibility.

[6] Operations at Trafigura's Mutoshi pilot project have been suspended in response to the threat of COVID-19 as of March 2020 (Trafigura n.d.).

[7] Interview, Trafigura CSR manager. June 2019.

[8] Interview, Mutoshi miner 1, March 2019.

[9] Figures presented at OECD Forum on Responsible Mineral Supply Chain. June 2019.

[10] Interview, Mutoshi miner 2, March 2019

volatility and fraud among traders. Team leaders are responsible for distributing profits, and earnings vary significantly due to labor diversification and the gendered division of labor (diggers, usually men, earn more than washers, predominantly women).

The steep decline of cobalt prices – from US$500 per ton of 2% grade cobalt to US$120 (Johansson de Silva et al., 2019) – since the official launch in early 2018 has significantly impacted the project. As a result of price fluctuations, a drop in workers' retention, and lack of liquidity, Chemaf withdrew certain key project deliverables such as regular and frequent payments to the miners, the surface-stripping of the mine, and the replacement of worn or lost safety equipment. Although these features were once billed as justification for lower earnings, artisanal miners at the site have now encountered a widening differential between what Chemaf pays COMIAKOL and the prices in nearby markets, leading the cooperative to withhold its sales to Chemaf on a few occasions and ASM workers to turn to outside traders to sell extracted ore. As a reminder that the project is not impervious to informal mining, Congolese of all ages line the side of the road outside the fenced perimeters of the concession, digging, selling, bargaining and bartering.

2.2. Kasulo

Before being known as a cobalt mining site, Kasulo designated a popular neighborhood of Kolwezi. The neighborhood grew haphazardly by partly infringing on a concession of state-owned Générale des Carrières et des Mines (*Gécamines*), the so-called *Polygone de la Manga* (Geenen, 2020). In 2014, according to local lore, a local dweller discovered cobalt beneath his house as he dug a new septic tank. From there on out, people started to dig throughout the area and the movement rapidly transformed the residential neighborhood into an informal artisanal mining site where *creuseurs* operated outside the law in highly dangerous and precarious conditions. This negative publicity put pressure on local authorities and Zhejiang Huayou Cobalt, owner of local operator Congo Dongfang Mining (CDM), to find a solution to the situation in Kasulo.[11] The first reaction was to impose a ban on artisanal mining operations in the area, which proved untenable.[12] Since Gécamines was still the holder of the concession, the second solution was to displace the residents of Kasulo and formalize the artisanal mining activities in the area.

In September 2017, the six hundred families living in Kasulo were paid by CDM to be displaced from the area, which in turn was reclassified by the provincial authorities as an artisanal mining area, or Zone d'Exploitation Artisanale (ZEA). CDM was given the responsibility to regulate extraction within a perimeter of two *carrés miniers* (mining squares) of 84.7 ha each in exchange for monopolistic control over production. To comply with the mining code, artisanal miners working within the concession ought to be registered in the local Mining Cooperative of Maadini Kwa Kilimo (CMKK), with whom CDM established its partnership. In order to ensure that cobalt from other mining sites would not "contaminate" the production, as one CDM agent put it to us in 2019, the first and major investment done by the company was to build a wall around its concession area to prevent non-registered miners from entering or any cobalt to leave the site. Between 2017 and 2018, two other *carrés miniers* (Kasulo II) were opened under CDM's responsibility, next to the first ZEA of Kasulo I.

The system developed at Kasulo was met with success since it built upon a labor force that was present and readily available. Under CDM supervision, these artisanal miners were only required to register with the partner cooperative to be allowed to continue their work under legal conditions. At its peak in 2017, CDM registered 14,000 *creuseurs* daily and the company reported an average of 600 trucks per month. As in Mutoshi, the slump in cobalt prices particularly impacted *creuseurs*, and many of them began mining copper given its more stable valuation. The number of daily workers in the site had decreased to as low as 500 to 800 miners and an average of 30 trucks per month during our visit in September 2019. In contrast with other crowded informal mining sites of copper and cobalt visited in 2019, this emptiness was a stark reminder of the limits of this formalization project and the burdens imposed on a reluctant workforce. Yet, in spite of the relative failure to retain *creuseurs*, the project was still presented as a success story in the formalization of the sector.[13] The achievement may well have come from CDM itself, by astutely moving away from widespread revelations of human rights violations to being recognized as a pioneer company in responsible sourcing from the artisanal sector.

From a technical standpoint, the core aspect of the deal between CDM and the *creuseurs* lies in the process of "découverture" paid by CDM. By removing the first five to twenty meters of sterile gravel, the company facilitated the work of *creuseurs* and improved their security by avoiding underground tunnels.[14] By deploying a wageless artisanal workforce instead of employees and heavy machinery, CDM avoided additional production costs, with the exception of the perimeter fencing and due diligence costs. Financially, the reliance on the flexible labor of artisanal miners also allowed for price variations and the risk of layoff to be cushioned by the workers themselves. Similarly, on-site buying houses decreased from 20 in 2018 to only three during our visit, of which only one was actively purchasing cobalt. With the sudden decrease in cobalt prices, miners simply stopped presenting themselves at the entry gate of Kasulo.

2.3. Kamilombe

Across the city of Kolwezi, 12 km away from its sister project of Kasulo, sits the mining concession of Kamilombe, which began production in 2003. The mine shares a number of features with others in the region: it was formerly a Gécamines concession; the exploration does not offer gainful, waged employment to its artisanal workforce, but grants access to resources – cobalt and copper – which should be traded locally; these workers, in turn, have little bargaining power over their highly fragmented and gender-based occupations, ranging from carriers, washers, collectors, to *depot* managers. Like other mines in Kolwezi, Kamilombe experienced a phase of overdemand in 2016 and oversupply in 2019.

Since 2009, CDM has taken the lion's share of managerial responsibilities over the site. However, the concession area and its exploration is shared with two additional entities: Kamoto Copper Company (KCC)[15] and "Ismael", a Lebanese trader who was been given a portion of the concession by the local government – unexplored as of

[11] CDM is a major cobalt producer supplying companies such as Daimler AG, Volkswagen and BYD, as well as Apple, Dell, HP, Huawei, Lenovo, Microsoft, Samsung, and Sony.

[12] The provincial authorities tried to curb the activity, but given the absence of alternative mining site, authorities tacitly accepted the uncontrolled development of the activities in Kasulo.

[13] This reputation was further consolidated by the "Better Cobalt" program, which generated significant attention in the responsible sourcing arena by being blockchain-ready (distributed ledger technology). Responsible Cobalt Sourcing Global Group (RCS), the company at the origin of "Better Cobalt," had been mandated to enforce CDM's due diligence and to develop a traceability system for cobalt purchased from artisanal operations.

[14] Data from RCS show a clear reduction in the numbers of accidents and fatalities in the area, although the nature of sulfide mineralization in Congo's copper and cobalt deposits will entail reaching greater depths at later stages.

[15] KCC is a subsidiary of Glencore, although the Swiss company has made explicit that it has no control or ownership stake over Kamilombe (See https://www.glencore.com/media-and-insights/news/Glencore-statement-on-child-labour-allegations). Alongside child labor allegations in 2019, the company was also implicated in the accidental death of 43 miners in the concession of KOV, one of the largest copper mines in the world operated by its subsidiary Katanga Mining.

2019 – in what was described to us as a "political solution" in response to the lack of jobs. Notwithstanding the shared management, CDM is still responsible for most of the investment and is seeking to develop an exclusive purchasing agreement with local buyers, who would in turn sell their production to CDM. Other than ensuring a stronger control over artisanal production, this arrangement would also alleviate the corporate burden over capital-intensive extractive methods and preclude the ever-present possibility of having the concession removed or the license not renewed.

Three main factors place Kamilombe apart from others mining concessions. First, the mine has experienced waves of violence over company property and industrial infrastructure – still visible in burned machinery within the concession – as recently as 2019. These attacks were described to us in September 2019 by local company representatives as being part of a strategy to ensure continued non-mechanized work by workers outside company payrolls. Second, access to Kamilombe is seemingly open and unregulated, whereby entrance to the concession's extant – and largely under-explored – mining area remains unsupervised. Given the lack of long-term investment in the mine, there is only a ditch around the concession meant to control access and prevent admission by children or pregnant women. A local representative of RCS monitors and records potential infringements on a daily basis, but no card verification is exercised. Unlike the situation in Kasulo, access is not strictly controlled and the number of artisanal miners has increased over time — from 1350 to roughly 3200 active workers as of September 2019, spread across 300 active pits. Third, and as a culmination of both equipment destruction and a lack of investment, the conventional "découverture" – meant to facilitate access to surface deposits below 40 m of depth – has not yet taken root, or is actively undermined. Instead, the more hazardous mining pits remain the preferred method deployed by miners to reach ore-rich deposits, in large part as these underground galleries have already been built.

In sum, despite being formally under the management of CDM with monitoring and documentary traceability provided by RCS, as in Kasulo, the concession resembles a large artisanal mining site with rich cooper and cobalt deposits, washing sections, and a fluctuating workforce. So much so, in fact, that workers are occasionally given food staples by local corporate management, evoking the tributary system of artisanal mining economies. And yet, this workforce actively resists the "découverture," despite the risks posed by underground pits, as well as the monopoly over buying and the uncertainties of price and value control, preferring an open market that encourages competition between traders for higher prices. Kamilombe, with its bustling population of mostly unregistered *creuseurs* and washers serving a transnational supply chain under the banner of responsible sourcing, is an apt illustration of the limits of formalized corporate concessions and the challenges to human security, to which we now move.

3. Human security and artisanal mining

In the DRC, an abundant labor force that frequently trespasses into mining concessions to mine cobalt is increasingly seen as problematic and acknowledged as such in the industry (Köllner, 2018). However, the formalization of artisanal workers has become a necessity to ensure regular cobalt supplies sold through registered buyers before transiting to refineries and international markets. This newfound impetus for mixed extraction methods can be justified by the moral responsibility of supporting the livelihoods of the hundreds of thousands of artisanal miners and their families; in terms of the political advantages of formalizing the sector "from below" by giving artisanal miners a formal and licit access to international markets; and in the pragmatic maintenance of sound community relations and corporate reputation by avoiding conflict with artisanal miners. In sum, the model mines described above aim to reconcile two seemingly contradictory objectives: first, improving workers' security and ensuring compliance with international standards; and second, extracting value from the artisanal sector by outsourcing labor costs and indirect control. This dual configuration – enhancing human security while responding to growing market demands – places enormous challenges on the socioeconomic well-being of local artisanal miners in a context of volatile human insecurity.

Since its introduction in the United Nations Development Programme's (UNDP) 1994 Human Development Report, the notion of human security has been viewed by some as a humanist alternative to orthodox views of security, while for others it is no more than a catchphrase in the global debate on the changing meaning of security (Homolar ,2015: 843; Oberleitner, 2005: 185). For Kaldor (2014), the concept of human security can be analyzed from three dimensions. First, human security concerns the security of individuals and the communities in which they live. Second, the term refers to the interrelationship between freedom from fear and freedom from want, defined in terms of physical as well as material insecurity. Finally, human security implies an extension of rule-governed security as opposed to war-based security, in which the relations between states are governed by law rather than by a war paradigm. As a 'people-centred' and 'multidimensional' concept, human security contributes to rethinking the field of security studies by focusing on the security of the individual (Wibben, 2008), which is to say the protection of "the vital core of all human lives in ways that advance human freedoms and human fulfillment" (Daase, 2010: 28).

Despite the all-encompassing approach often taken in definitions of human security, we expand its purview to include the welfare of ordinary people in natural resource management. Using the lens of human (in)security in the aftermath of reforms in the extractive sector, we shift away from the ownership of resources to their management, access, and labor extraction. Our contribution unfolds in two key related ways: first, we refine the concept of "human security" by including everyday working conditions of artisanal miners in mixed modes of extraction. Specifically, we problematize the conditions under which mining companies recruit and rely on artisanal miners and its broader effects on social reproduction. Second, we contribute to this reflection by examining how flexible labor relations in mixed mines interlock with highly complex and fluctuating global supply chains.

From the prism of human security, we suggest, the combined effect of wageless formalization and corporate-led responsible mining enables the relocation of responsibility away from work protection and income security toward flexible precariousness. If the brunt of this impact lies with the artisanal mining sector itself, less attention has been devoted to the effects of formalization in reshaping labor relations between employer and employee, and how the experience of artisanal cobalt mining is linked to transnational corporate supply chains. We contend that while corporate partnerships seek to improve certain dimensions of human security, such as physical safety improvements or protection against organized violence, precarious labor regimes that rest on wageless artisanal work may also heighten miners' exposure to commodity price fluctuations and precipitates widespread food and financial insecurity.

The three cases of responsible partnerships described earlier, thus, offer tangible improvements in terms of the health and work safety of artisanal miners. Yet, a human security framework helps account for how these partnerships also reduce the capabilities of miners to control access to markets and other forms of social protection that they would otherwise obtain in informal mining. These would include the power to decide over the sale of the extracted commodity, the ability to eschew corporate control without employment benefits, or the reliance on kin, neighborly, or friendship support networks. This loss of informal protection is the effect of two interrelated processes structurally imbricated in the design of corporate-led formalization: wageless labor regimes and the outsourcing of corporate responsibility.

4. Corporate-led formalization

The line between the formal and informal mining economy is prone to overlaps, with the effects of expanded industrial mining and formalization seeping into daily life. As different scholars have productively shown, artisanal miners are far from being autonomous agents and are embedded in complex networks and dependent relationships (De Haan and Geenen, 2016). These are likely to expand beyond conventional boundaries between the licit and the illicit, the formal and the informal, the legal and the illegal. The concept of economic informality and formalization has been amply discussed, from economic anthropologists (Hart, 1973) to property economists such as De Soto (1989). For Keith Hart, who first coined the term, the informal economy would denote different kind of informal income opportunities deriving from economically efficient production practices. In De Soto's view, customary or informal activities are "extralegal" and can be absorbed into the legal framework of the State through a process of "formalization" that entails the capitalization and mechanization of mining work away from poverty-stricken subsistence practices. This latter view, well anchored in liberal economics, is dominant in policy and corporate circles seeking to refrain or constrain ASM (Bryceson and Jønsson, 2014), but is increasingly subject to criticism.[16]

These suggestions strongly resonate in the context of the DRC where plural systems of property rights overlap (Katz-Lavigne, 2019), leaving miners seeking to work legally with few options than to enroll into corporate partnership to access viable deposits. Moreover, the copper and cobalt sector in the DRC is a complex and highly segmented labor market, intersecting direct and indirect jobs, skilled and unskilled workers, permanent and day laborers (Rubbers, 2019), as well a large pools of "clandestine" yet authorized miners (Katz-Lavigne, 2020). While small-scale mining operators often rely on artisanal miners, the emergence of wageless artisanal labor regimes integrated in responsible initiatives led by large mining companies is a novel phenomenon that warrants further attention. Rather than taking waged labor as the paragon of human and economic security, this section examines the conditions and outcomes of formalization led by mining companies, shedding light on these partnerships, their limitations, and effects on mining labor.

4.1. Formalization in the DRC

The first attempts to legalize the ASM sector in DRC date back to then Zaire's President Mobutu Sese Seko in 1982 (Law No. 82/039). As the state struggled to provide for its citizens and with the collapse of the productive capacity of Gécamines, Congolese citizens were incentivized to "debrouillez-vous" ('fend for yourself'), namely by permitting the free circulation of minerals. With the first and second Congolese wars (1996–1997; 1998–2003), compounded by the retreat of foreign mining companies, artisanal mining became more rampant and increasingly entangled with conflict. By 2002, in an effort to protect the country's natural resources and the Congolese mining industry, Law No. 007/2002 was implemented by President Joseph Kabila with the support of the World Bank and IMF. The 2002 law aimed to formalize ASM and fuel growth of DRC's mining industry through the creation of *Zones d'Exploitation Artisanale* (ZEAs).

To operate legally under the Mining Code, *creuseurs* were required to obtain a *carte d'exploitant artisanal* to mine in designated areas (Garrett, 2016: 379).[17] Although Congolese nationals with proper permits are allowed to mine, according to the letter of the law, the occasional presence of private military and security company guards often prevents access to mining sites. Furthermore, under Article 111, should the permit be lost, destroyed or stolen, authorization for artisanal mining would not be reissued, adding to the vulnerability of *creuseurs* (Democratic Republic of Congo, 2002). Finally, the 2002 mining code states that ZEAs should be developed in areas where "the technological and economic factors are not suited for the site to be industrially exploited" (*id.*), but these remain scarce in number. Industrial mining leases, however, cannot be converted into ZEAs and mining companies cannot be granted research permits within ZEAs, "except for demands by artisanal miners' cooperatives" (Geenen, 2012: 325).

This legal framework implies that ZEAs would be limited to the least profitable areas and poorer ore deposits. Due to greater financial control over taxation and revenue, the code also gives priority to large-scale industrial projects, allowing companies' access to large areas on long-term contracts under relatively liberal tax regimes (Geenen and Radley, 2014: 58). This has become an increasing source of contention between artisanal miners and large-scale corporate mining actors due to disadvantageous conditions for artisanal miners and poor enforcement of favorable legal provisions. In an attempt to mitigate these concerns and "protect the socioeconomic future of DRC," the 2002 mining code was revised in 2018, to the opposition of many major mining companies operating in the country.[18]

4.2. Risks and insecurities of formalization

The Copperbelt area in southeastern DRC in particular has seen a significant rise of ASM due to the absence of other livelihood strategies, a lack of governmental policies fostering alternatives (Maclin et al., 2017), and favorable commodity prices. Although reliable estimates are difficult to obtain, approximately 60% of Congolese households in the former Katanga Province rely upon artisanal mining for their livelihoods, both directly and indirectly for supplementary income (Faber et al., 2017), and up to 150,000 people find work in the sector (Sovacool, 2019: 923). As we have seen, the recent influx in mining investments has taken a particular interest in formalizing the artisanal and small-scale mining sector, altering the previously established correlation of forces between ASM and corporate actors, while raising new obstacles for *creuseurs*. The following four features of these formalization schemes – working precarity, cooperative intermediation, unpredictable income, and the normative bias of formalized regularity – throw in sharp relief the problem of human security for wageless miners.

First, in spite of formalization efforts, most *creuseurs* still remain in precarious working conditions. Safe and secure access to mining areas represents a challenge for *creuseurs*, with many sites guarded by police, private security companies or the Forces Alliances Republique Democratic Congo (FARDC). Extortion is also common, and *creuseurs* are often forced to pay a premium to access sites despite having the appropriate permits. Based on field observations, bribes and unofficial fees are routinely solicited by guards or mining police, or with the connivance of the agency for supporting and framing artisanal mining (*Service d'Assistance et d'Encadrement de la Mine Artisanale et à Petite Echelle*, SAEMAP), and miners frequently pay a commission to the *police des mines*

[16] Namely of formalization policies that often result in the actual informalization of labor (Verbrugge and Geenen, 2020). Accordingly, a "legalist" top-down approach to formalization is being challenged by voices reclaiming an approach to development more grounded in ASM realities (e.g. Hilson et al., 2017).

[17] The 2002 mining code distinguishes three modes of production and corresponding tax regimes. After a phase of exploration under a research permit, a parcel of land can be attributed for industrial extraction. Deposits that are not suitable for industrial mining can be granted a small-scale mining license for up to ten years.

[18] The implemented revisions included the removal of a stability clause that provided a 10-year protection for miners from changes in the fiscal and customs regime, raised royalties on strategic metals, such as cobalt, and included a 50% tax on super profits (Sanderson 2018).

upon exit of concession areas with extracted ore. Similarly, traders employ tactics of knowledge asymmetry at the cost of the *creuseurs*.[19]

Second, the region is covered by *permis d'exploitation* (PEs) and research permits (see map) for industrial purposes, with hardly any opportunities for artisanal miners to work in fully legal conditions as the law stipulates that ASM can only take place in registered ZEAs organized as cooperatives. Based on field interviews and survey results, miners reported working at a variety of sites, but only 14% of respondents were aware of ZEAs. In addition, the cooperatives created with the aim of legalizing informal ASM practices may offer a way for corporations to pull out of direct control and responsibility over its workforce.

Third, despite the newfound freedom to mine legally, *creuseurs* lack the financial security guaranteed by most formalized occupations. Most commonly among the questionnaires and interviews conducted were concerns over the lack of alternative employment opportunities. formalization has also significantly impacted earnings, with a large discrepancy reported by miners who can earn twice as much as other miners in the same site (CDM concession). The price volatility of international markets took a heavy toll on the livelihoods of creuseurs, as the majority of respondents (93%) in our 2019 survey report mining as their main source of income with no other personal or household source to supplement their livelihoods. As renumeration paid to cooperatives is often based on London Metal Exchange rates, cobalt's recent two-year low of $32,000 per tonne in comparison with prices near $100,000 per tonne in the first half of 2018, has led many miners to turn to copper alternatives less prone to price fluctuations. Furthermore, there was widespread consensus that miners were not receiving a fair price for the product of their work, which is often paid by weight and grade quality, and seen as manipulated by locally available technology.[20]

Finally, *creuseurs* engage with the ASM sector in a highly flexible manner, alternating their areas of extraction and mineral or metal of choice in line with the season, international markets, or personal needs. However, efforts to formalize ASM inadvertently restrict the flexibility and freedom of these miners, most notably in accessing informal sources of social protection. What is more, formalization has become the legal condition for resource extraction, isolating those who are not able or do not possess the correct papers or identification to work within the formal economy. In other words, the formalization of DRC's ASM sector has acted as a means of differentiating between 'licit' and 'illicit' sources, and in turn exacerbating the repressive action of states and private stakeholders. Despite the beneficial, or at least reputationally sound intentions of formalization, it has enabled corrupt practices and further normalized the repressive actions of state and private actors, who seek to prevent activities that pose reputational risk, such as child labor. In practice, however, the presence of artisanal miners is tolerated within certain portion of PEs, as we could observe in our visits to mining sites in Kolwezi. Incursions into portions of PEs are frequent and nearly all of our respondents have been evicted at least once by police or military forces. Although technically illegal, the activity is to a large extent regulated by state institutions such as the mining police, the SAEMAP, the DGM (Direction Générale des Migrations), and the ANR (Agence Nationale de Renseignement).

In practice, both industrial and artisanal production and their corresponding supply chains are likely to overlap. Artisanal and large-scale mining are often in competition, leading to situations of conflict (e.g. Bolay, 2014; Katz-Lavigne, 2019). To appease such conflicts, a pragmatic "tolerance" (Bolay 2016) or knowledge "cooption" (Calvão, 2017) reigns when artisanal and industrial mining contest the same spaces and resources. Besides these forms of tolerance, the "interface" (Kemp and Owen, 2019) or forced "co-habitation" (Hilson et al., 2020) between ASM and LSM is also subject to recurring tensions and conflicts tilting on behalf of mining companies with the backing of governmental authorities.

For their part, mining companies face two main "risks": one is having their infrastructures attacked, as was the case in Kamilombe shortly before our visit; the other is to be held "responsible" for the accidents of artisanal miners within PEs. And yet, allowing ASM activities within concession areas can offer an economic and strategic advantage to these companies, by bringing a higher-ore content and by deflecting artisanal miners away from core mining areas. Moreover, *creuseurs* represent a significant source of flexible labor, given that ASM engagement requires substantially less long-term planning and infrastructure investment for transnational corporations, in comparison to pursuing LSM endeavours. Such constellations suggest a move from longstanding practices of exploiting informalized labor, such as those depicted by Verbrugge (2015), towards the instrumental formalization of workers within the scope of ASM-LSM partnerships. While drawing their legitimacy from claims of improving the physical security of workers, the establishment of a wageless workforce integral to corporate supply chains raises other problems of conceptual and empirical relevance. In fact, the case of multinational companies operating in the DRC while pulling away from the responsibility of paying their workforce may represent the dawn of non-waged labor relations without distributive or protective measures.[21] We now turn to this form of corporate outsourcing of responsibility.

5. Corporate outsourcing of responsibility

As we have seen in the cobalt-rich area of Kolwezi, the formalization of the cobalt mining sector has occurred under the aegis of corporate-led labor regimes in collaboration with local cooperatives acting as labor recruiters. Whereas policies aimed at formalizing the artisanal sector have been met with little success (Geenen, 2012), the shift toward formalization through the corporate sector raises new questions. As Lee (2018: 45) observed in the neighboring mines of the Zambian Copperbelt, mining corporations divert most of their tasks to subcontractors, some of which are paid at a piece rate per cubic meter in return for labor, and a significant amount of menial tasks in mining companies in the DRC is outsourced or provided by day laborers or unskilled workers (Rubbers, 2019). The scope of the formalization efforts examined here and their effects on the future of wageless artisanal work dependent upon mining companies constitute a different challenge altogether. These corporate strategies aiming to develop sustainable and responsible business practices would represent a novel tactic of dispossession (Frederiksen and Himley, 2020), distinct from Corporate Social Responsibility (CSR) programs and subsumed under the logics of what we call corporate outsourcing of responsibility.

The CSR movement has seen a growing interest in scholarly research as a voluntary and malleable set of practices reconciling moral legitimacy and market interests (Rajak, 2011; Walker-Said and Kelly, 2015; Welker, 2014). For extractive industries, CSR potentially offers a potential roadmap for sustainable development, furthering the

[19] This figure excludes responses that were either invalid or not applicable.

[20] This would include weight scales and ""metorex"" technology used to assess the grade content of cobalt. Out of 81 respondents, only two declared trusting these instruments.

[21] This is not to suggest that waged employment should be the normative linchpin for any kind of secure, rewarding, or standard work. In fact, the paradigm of wageless work or what constitutes the "proper job" (Ferguson and Li, 2018) has been increasingly challenged and, as James Ferguson reminds us (2015:19), "wage labor–based livelihoods are simply not going to return." However, this future of wagelessness is often tied to new distributive practices that compensate for the loss of direct wage incomes. The case of this non-wage earning workforce in corporate cobalt mines, examined in further detail in (Bolay and Calvão, 2021), is revealing precisely for its salient role to the workings of a critical supply chain while resonating with the growing literature on "redundant", "disposable" and "surplus" populations (Bauman, 2004; Smith, 2011; Sassen, 2014).

participation and role of community partnerships (Jenkins, 2004; Fordham et al., 2018). Critics of CSR programs see these initiatives as a means of stifling criticism and managing risk, reconciling moral authority with disciplining practices reminiscent of former corporate paternalism, whereas its proponents justify CSR as an ethical pathway to strengthen business models (Welker, 2014).

In the case of the DRC's cobalt sector, corporate engagement with artisanal miners lessens the reputational risks for the companies involved, increases their ability to source cobalt, and offers a conditional legal pathway for artisanal mining. Similarly to CSR programs, it extends corporate authority by replacing the state in creating opportunities for artisanal miners. Although framed as responsible mining initiatives, the cases described here represent a key difference with the "win-win" situation of CSR in that mining corporations in Kolwezi actively seek to evade the accrued responsibilities of formalization while reaping its benefits. By relying on a flexible workforce without incurring the costs of secure waged labor, companies conveniently shift the risk of price fluctuations and reputational damage to artisanal miners, as seen in Huayou's recent decision to suspend its program of cobalt acquisition from artisanal sources. Moreover, this outsourced responsibility provides a cover of plausible deniability in the event of exposure to sourcing, human rights, or labor violations.

Despite the stringent conditions of "model mines" in Kolwezi to ensure that cobalt mined by unwaged artisanal workforce is not "contaminated," the legal imposition of formal artisanal explorations and an ever-present reliance on a loosely regulated network of registered *comptoirs* has permitted the outsourcing of corporate responsibility for segregating production from both sources onto miners themselves. At Mutoshi Cobalt, for example, Trafigura aspires to trace the cobalt supply chain from its extraction to refinement, purchasing and transportation, all the way through to its delivery as cobalt hydroxide. Following extraction from the open pits, workers bring bags of cobalt to one of ten open basins filled with water, where predominantly women sort through and wash the cobalt.[22] After washing the extracted cobalt, miners are responsible for taking it to the buying station, at which point it is logged and processed, and tested for purity. The CDM-ran Kamilombe project further substantiates the idea, expressed to us in September 2019 by a representative of an NGO accompanying the Cobalt For Development initiative, that "model mine is just a name (…) At the end of the day, all minerals are bought [by the companies], irrespective of their origin."

While the expansion of extractive industries has often been analyzed in terms of spatial displacement, our suggestion of corporate outsourcing of responsibility takes waged work and labor as critical lenses in processes of inequality, dispossession, and exploitation (Calvão, 2016; Ferguson and Li, 2018; Li, 2011; Smith, 2011). Given the varying degrees of earnings, absenteeism and retention rates, and ease of access, the adoption of non-wage earners in "mixed" mode of extraction has led to the outsourcing of the costs necessary for the reproduction of labor power, or the reduction of production costs permitted by a self-employed workforce. By avoiding fixed incomes, significant attention has been instead devoted to workers' safety, with free Personal Protective Equipment (PP&E) being provided to cooperative members in Mutoshi Cobalt and Kasulo. In mining shafts where basic safety regulations are rarely enforced, the sight of gloves, uniforms, hard-hats, safety glasses or steel toed boots is a welcome, but largely symbolic improvement. Moreover, discrepancies could be observed during site visits between guidance and implementation, with some workers not wearing the equipment properly, or failing to wear it at all. Aside from difficulties in distributing and implementing safety equipment, the process of "découverture" is meant to improve the safety of workers, mitigate risk, and increase productivity, although met with contradictory responses by miners themselves. As we have discussed, the mechanical stripping of surface gravel can also be met with resistance from miners or be justified by adding to corporate profit margins.

The sway of these measures should not distract us from the importance of trading and pricing strategies associated with mixed mining sites. Cobalt prices vary widely throughout the industry and even within the same site, depending on the worker's role and the grade of cobalt extracted. Although workers are free to move in and out of concession areas, these projects often restrict workers' access to the open market at the risk of losing the right to access formalized mining areas. As detailed earlier, the growing disparity in prices between Chemaf and local market rates, in addition to a widespread distrust with technologies to assess the quantity and quality of extracted ore, has led miners on occasion to sell their production outside the scope of the partnership. In Kasulo, for its part, CDM purchases the entire production, and sales are made to local buying houses accredited by the company. While the deal between CDM and the cooperative entails a monopoly over the production, the company does not buy directly from the miners. Instead, it allows buying houses judged compliant with its due diligence policy to compete in a closed market within the concession's limit. In establishing this market simulacrum, CDM avoids being accused of imposing its prices on miners. Yet, being the only buyer for these various buying houses, the company can indirectly impose prices on *creuseurs*.

The logics of corporate outsourcing of responsibility delineated above are reinforced by the mining code, according to different participating companies. Kasulo stands in contrast to other similar partnerships as a properly licensed artisanal exploration zone. This meant that it could be reallocated to a different company or be recategorized as an industrial exploration, thus justifying limited investments in basic mining infrastructures. Across the different cases examined, this also meant that the work of regulating labor within the concession was outsourced to institutions specific to the artisanal sector, such as the partnering cooperative or the Service for Assistance and Supervision of Artisanal and Small-Scale Mining (SAEMAPE), funded by the state and not the company.

While Mutoshi can be seen as part of Trafigura and Chemaf's CSR strategies, the dedicated ZEA delegated to CDM in Kasulo and Kamilombe emerged in response to the sudden rush of ASM inside one of Kolwezi's most densely populated neighborhoods. At Trafigura, the official position is that ASM "can't be wished away", thereby leading the company to anticipate potential risks by developing the project in Mutoshi. Glencore, for its part, "does not support artisanal mining"[23] despite retaining indirect control of the Kamilombe project through CDM, jointly owned by Glencore and Gécamines. From an institutional perspective, thus, these cases present an interesting entanglement of various private and state actors as well as of artisanal and industrial logics.

The three projects examined similarly embrace a logic of outsourcing of control and responsibility, as made clear in the intermediary role of buying houses in purchasing ore from artisanal miners. Given that the purchasing setting and price variations were a regular source of mistrust and conflict, according to our field survey and observations,[24] it is likely that, in addition to its legitimizing effect, the procurement through buying houses represents a means to outsource the burden of these

[22] While it increases the overall price paid per bag (discarding low-grade ore), it is poorly remunerated in comparison to more lucrative processes such as extraction.

[23] Glencore's approach was widely reported in the media. See, e.g., Financial Times "Unregulated cobalt mining cannot be 'wished away', Trafigura says," October 8, 2018. As recently as May 2020, the Head of Sustainable Development at Glencore, Anna Krutikov, restates this company policy by claiming that "We don't buy or process any materials that come from artisanal mining." See "How Swiss cobalt traders are trying to prevent child labour," Swissinfo.ch, May 4, 2020.

[24] In particular, different instances of issues with buying houses cheating on the grade or the weight of cobalt by trafficking their measurement devices were commonly reported.

possible sources of tensions to a third party. Our observations showed that prices at Kasulo were slightly higher than in the free market at Musompo on the outskirts of Kolwezi, which suggests a comparatively good opportunity for miners working at Kasulo. This surprising observation can be explained by the minimization of intermediaries, as well as logistical and transport costs, made possible by the presence of the buying houses directly within the concession. Notwithstanding, the entire architecture of these schemes builds upon a principle of displacing the costs and risks down to the miners, but also to a series of intermediary actors such as the buying houses or the cooperative, while still retaining economic control over these entities.

6. Discussion and conclusion

This paper examined the conditions and effects borne out of formalization efforts in the DRC from the situated perspective of different forms of mining work experienced by the actors of the cobalt supply chain. Whereas the logics of outsourcing and subcontracting have been imposed in the mining sector across the Copperbelt (e.g. Lee 2018, Rubbers 2019), the cases we present here are pursued with the explicit goal of supporting the livelihoods of miners and offering a legal pathway for the artisanal sector through the vocabulary of "responsible sourcing." What is more, the reliance on artisanal miners and the conditions of remuneration and access to the open market may inadvertently foster new forms of dispossession and insecure labor while enabling the outsourcing of risks and responsibility by industrial corporate actors.

Despite different legal frameworks, the three projects described earlier share more commonalities than differences, especially from the perspective of addressing workers' human security and labor. These projects attract artisanal miners by facilitating access to working sites, namely by removing the first layer of sterile land, and ensuring safer working conditions. However, this approach rests on a narrow understanding of human security, from which social protection – against illness, job loss, or price fluctuations for instance – is excluded. Moreover, while a human security lens is mindful of the welfare of ordinary workers, the cases of miners utilized by companies without gainful employment raise the critical questions of what constitutes a fair compensation for the taxing labor of mining, as well as the inadvertent effects of a labor regime premised on added flexibility but decreased autonomy.

Two unintended consequences emerge out of the regulatory efforts toward formalization. First, in opposition to informal mining, wageless corporate workforces have become the legal condition for resource extraction. As such, formalization efforts reinforce a specific narrative of legal and illegal extraction that excludes vulnerable *creuseurs* and reinforces the role of private security forces, industrial companies, and due diligence schemes as legitimate guarantors of 'legal' mineral extraction. Second, ASM and industrial miners work alongside, at times in opposition, but never fully outside the purview of industrial extractions in the DRC. This calls for a critique of the divide between formal and informal work, artisanal and industrial labor, and for a new understanding of the intertwined relationship between different modes of producing natural wealth.

This article has aimed to highlight a novel corporate-led formalization of mining labor and the introduction of what we call the outsourcing of corporate responsibility. Working through the unexpected collaborations at the edges of capitalist extraction, we are still left to speculate on the final consequences of processes of formalization and corporate reliance on artisanal mining labor. The composite picture that emerges from a close examination of everyday working conditions and market access for artisanal miners is as heterogeneous as it can be contradictory. Despite the benefits of formalization, the economic security of artisanal miners risks becoming a moot point in a narrow understanding of human security rooted primarily on workplace security and access to health. Paradoxically, responsible sourcing schemes in mixed mines further tilts the burden of price fluctuations, job insecurity, and economic precarity onto miners themselves. As this discussion foregrounds disputes between law and violence, security and flexible labor regimes, we hope this article sets new ground for examining expanding processes of mining formalization led by large corporate actors. Though in response to increased corporate scrutiny and as part of responsible mining initiatives, these formalization strategies in the DRC risk exacerbating the vulnerability and insecurity of these populations in a context of outsourced corporate of responsibility.

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